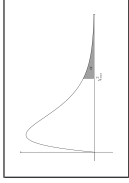


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- Tabela 1: Tabela da distribuição normal padrão –  $p = P(0 \leq Z \leq z)$
  - Tabela 2: Tabela da distribuição acumulada da normal padrão –  $\Phi(z) = P(Z \leq z)$ ,  $z \geq 0$
  - Tabela 3: Valores críticos  $\chi_{n,\alpha}^2$  da qui-quadrado –  $P(\chi_n^2 > \chi_{n,\alpha}^2) = \alpha$
  - Tabela 4: Valores críticos da distribuição  $t$
  - Tabela 5: Valores críticos da distribuição  $F$  –  $\alpha = 0,05$
  - Tabela 6: Valores críticos da distribuição  $F$  –  $\alpha = 0,025$
  - Tabela 7: Valores críticos da distribuição da amplitude studentizada –  $\alpha = 0,05$
  - Tabela 8: Valores críticos da distribuição da amplitude studentizada –  $\alpha = 0,01$
  - Tabela 9: Valores críticos da distribuição das amplitudes múltiplas de Duncan –  $\alpha = 0,05$
  - Tabela 10: Valores críticos da distribuição das amplitudes múltiplas de Duncan –  $\alpha = 0,01$





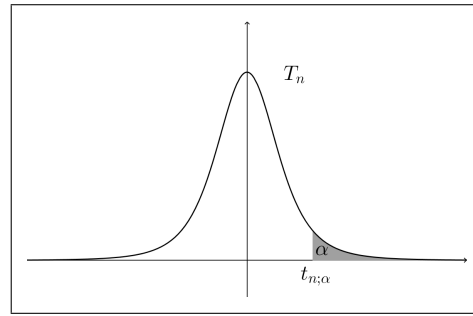




**Tabela 3** – Valores críticos  $X_{n,\alpha}^2$  da qui-quadrado:  $\alpha = P(X_n^2 > X_{n,\alpha}^2)$

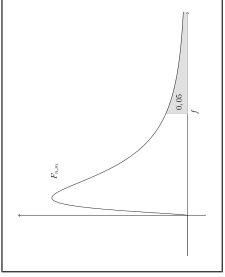
| gl | Área $\alpha$ na cauda superior |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
|----|---------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
|    | 0,999                           | 0,995  | 0,990  | 0,980  | 0,975  | 0,950  | 0,900  | 0,800  | 0,200  | 0,100  | 0,050  | 0,025  | 0,020  | 0,010  | 0,005  | 0,001  |  |
| 1  | 0,000                           | 0,000  | 0,000  | 0,001  | 0,001  | 0,004  | 0,016  | 0,064  | 1,642  | 2,706  | 3,841  | 5,024  | 5,412  | 6,635  | 7,879  | 10,828 |  |
| 2  | 0,002                           | 0,010  | 0,020  | 0,040  | 0,051  | 0,103  | 0,211  | 0,446  | 3,219  | 4,605  | 5,991  | 7,378  | 7,824  | 9,210  | 10,597 | 13,816 |  |
| 3  | 0,024                           | 0,072  | 0,115  | 0,185  | 0,216  | 0,352  | 0,584  | 1,005  | 4,642  | 6,251  | 7,815  | 9,348  | 9,837  | 11,345 | 12,838 | 16,266 |  |
| 4  | 0,091                           | 0,207  | 0,297  | 0,429  | 0,484  | 0,711  | 1,064  | 1,649  | 5,989  | 7,779  | 9,488  | 11,143 | 11,668 | 13,277 | 14,860 | 18,467 |  |
| 5  | 0,210                           | 0,412  | 0,554  | 0,752  | 0,831  | 1,145  | 1,610  | 2,343  | 7,289  | 9,236  | 11,070 | 12,833 | 13,388 | 15,086 | 16,750 | 20,515 |  |
| 6  | 0,381                           | 0,676  | 0,872  | 1,134  | 1,237  | 1,635  | 2,204  | 3,070  | 8,558  | 10,645 | 12,592 | 14,449 | 15,033 | 16,812 | 18,548 | 22,458 |  |
| 7  | 0,598                           | 0,989  | 1,239  | 1,564  | 1,690  | 2,167  | 2,833  | 3,822  | 9,803  | 12,017 | 14,067 | 16,013 | 16,622 | 18,475 | 20,278 | 24,322 |  |
| 8  | 0,857                           | 1,344  | 1,646  | 2,032  | 2,180  | 2,733  | 3,490  | 4,594  | 11,030 | 13,362 | 15,507 | 17,535 | 18,168 | 20,090 | 21,955 | 26,124 |  |
| 9  | 1,152                           | 1,735  | 2,088  | 2,532  | 2,700  | 3,325  | 4,168  | 5,380  | 12,242 | 14,684 | 16,919 | 19,023 | 19,679 | 21,666 | 23,589 | 27,877 |  |
| 10 | 1,479                           | 2,156  | 2,558  | 3,059  | 3,247  | 3,940  | 4,865  | 6,179  | 13,442 | 15,987 | 18,307 | 20,483 | 21,161 | 23,209 | 25,188 | 29,588 |  |
| 11 | 1,834                           | 2,603  | 3,053  | 3,609  | 3,816  | 4,575  | 5,578  | 6,989  | 14,631 | 17,275 | 19,675 | 21,920 | 22,618 | 24,725 | 26,757 | 31,264 |  |
| 12 | 2,214                           | 3,074  | 3,571  | 4,178  | 4,404  | 5,226  | 6,304  | 7,807  | 15,812 | 18,549 | 21,026 | 23,337 | 24,054 | 26,217 | 28,300 | 32,909 |  |
| 13 | 2,617                           | 3,565  | 4,107  | 4,765  | 5,009  | 5,892  | 7,042  | 8,634  | 16,985 | 19,812 | 22,362 | 24,736 | 25,472 | 27,688 | 29,819 | 34,528 |  |
| 14 | 3,041                           | 4,075  | 4,660  | 5,368  | 5,629  | 6,571  | 7,790  | 9,467  | 18,151 | 21,064 | 23,685 | 26,119 | 26,873 | 29,141 | 31,319 | 36,123 |  |
| 15 | 3,483                           | 4,601  | 5,229  | 5,985  | 6,262  | 7,261  | 8,547  | 10,307 | 19,311 | 22,307 | 24,996 | 27,488 | 28,259 | 30,578 | 32,801 | 37,697 |  |
| 16 | 3,942                           | 5,142  | 5,812  | 6,614  | 6,908  | 7,962  | 9,312  | 11,152 | 20,465 | 23,542 | 26,296 | 28,845 | 29,633 | 32,000 | 34,267 | 39,252 |  |
| 17 | 4,416                           | 5,697  | 6,408  | 7,255  | 7,564  | 8,672  | 10,085 | 12,002 | 21,615 | 24,769 | 27,587 | 30,191 | 30,995 | 33,409 | 35,718 | 40,790 |  |
| 18 | 4,905                           | 6,265  | 7,015  | 7,906  | 8,231  | 9,390  | 10,865 | 12,857 | 22,760 | 25,989 | 28,869 | 31,526 | 32,346 | 34,805 | 37,156 | 42,312 |  |
| 19 | 5,407                           | 6,844  | 7,633  | 8,567  | 8,907  | 10,117 | 11,651 | 13,716 | 23,900 | 27,204 | 30,144 | 32,852 | 33,687 | 36,191 | 38,582 | 43,820 |  |
| 20 | 5,921                           | 7,434  | 8,260  | 9,237  | 9,591  | 10,851 | 12,443 | 14,578 | 25,038 | 28,412 | 31,410 | 34,170 | 35,020 | 37,566 | 39,997 | 45,315 |  |
| 21 | 6,447                           | 8,034  | 8,897  | 9,915  | 10,283 | 11,591 | 13,240 | 15,445 | 26,171 | 29,615 | 32,671 | 35,479 | 36,343 | 38,932 | 41,401 | 46,797 |  |
| 22 | 6,983                           | 8,643  | 9,542  | 10,600 | 10,982 | 12,338 | 14,041 | 16,314 | 27,301 | 30,813 | 33,924 | 36,781 | 37,659 | 40,289 | 42,796 | 48,268 |  |
| 23 | 7,529                           | 9,260  | 10,196 | 11,293 | 11,689 | 13,091 | 14,848 | 17,187 | 28,429 | 32,007 | 35,172 | 38,076 | 38,968 | 41,638 | 44,181 | 49,728 |  |
| 24 | 8,085                           | 9,886  | 10,856 | 11,992 | 12,401 | 13,848 | 15,659 | 18,062 | 29,553 | 33,196 | 36,415 | 39,364 | 40,270 | 42,980 | 45,559 | 51,179 |  |
| 25 | 8,649                           | 10,520 | 11,524 | 12,697 | 13,120 | 14,611 | 16,473 | 18,940 | 30,675 | 34,382 | 37,652 | 40,646 | 41,566 | 44,314 | 46,928 | 52,620 |  |
| 26 | 9,222                           | 11,160 | 12,198 | 13,409 | 13,844 | 15,379 | 17,292 | 19,820 | 31,795 | 35,563 | 38,885 | 41,923 | 42,856 | 45,642 | 48,290 | 54,052 |  |
| 27 | 9,803                           | 11,808 | 12,879 | 14,125 | 14,573 | 16,151 | 18,114 | 20,703 | 32,912 | 36,741 | 40,113 | 43,195 | 44,140 | 46,963 | 49,645 | 55,476 |  |
| 28 | 10,391                          | 12,461 | 13,565 | 14,847 | 15,308 | 16,928 | 18,939 | 21,588 | 34,027 | 37,916 | 41,337 | 44,461 | 45,419 | 48,278 | 50,993 | 56,892 |  |
| 29 | 10,986                          | 13,121 | 14,256 | 15,574 | 16,047 | 17,708 | 19,768 | 22,475 | 35,139 | 39,087 | 42,557 | 45,722 | 46,693 | 49,588 | 52,336 | 58,301 |  |
| 30 | 11,588                          | 13,787 | 14,953 | 16,306 | 16,791 | 18,493 | 20,599 | 23,364 | 36,250 | 40,256 | 43,773 | 46,979 | 47,962 | 50,892 | 53,672 | 59,703 |  |

**Tabela 4**  
 Valores críticos  $t_{n,\alpha}$  da t-Student  
 $\alpha = P(T_n > t_{n,\alpha})$



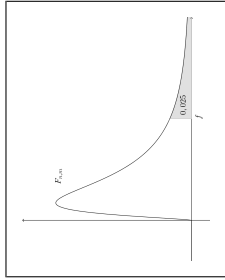
| gl<br>n | Área $\alpha$ na cauda superior |       |       |       |       |        |        |        |        |        |         |         |         |
|---------|---------------------------------|-------|-------|-------|-------|--------|--------|--------|--------|--------|---------|---------|---------|
|         | 0,150                           | 0,100 | 0,060 | 0,050 | 0,040 | 0,030  | 0,025  | 0,020  | 0,010  | 0,005  | 0,0025  | 0,002   | 0,001   |
| 1       | 1,963                           | 3,078 | 5,242 | 6,314 | 7,916 | 10,579 | 12,706 | 15,895 | 31,821 | 63,657 | 127,321 | 159,153 | 318,309 |
| 2       | 1,386                           | 1,886 | 2,620 | 2,920 | 3,320 | 3,896  | 4,303  | 4,849  | 6,965  | 9,925  | 14,089  | 15,764  | 22,327  |
| 3       | 1,250                           | 1,638 | 2,156 | 2,353 | 2,605 | 2,951  | 3,182  | 3,482  | 4,541  | 5,841  | 7,453   | 8,053   | 10,215  |
| 4       | 1,190                           | 1,533 | 1,971 | 2,132 | 2,333 | 2,601  | 2,776  | 2,999  | 3,747  | 4,604  | 5,598   | 5,951   | 7,173   |
| 5       | 1,156                           | 1,476 | 1,873 | 2,015 | 2,191 | 2,422  | 2,571  | 2,757  | 3,365  | 4,032  | 4,773   | 5,030   | 5,893   |
| 6       | 1,134                           | 1,440 | 1,812 | 1,943 | 2,104 | 2,313  | 2,447  | 2,612  | 3,143  | 3,707  | 4,317   | 4,524   | 5,208   |
| 7       | 1,119                           | 1,415 | 1,770 | 1,895 | 2,046 | 2,241  | 2,365  | 2,517  | 2,998  | 3,499  | 4,029   | 4,207   | 4,785   |
| 8       | 1,108                           | 1,397 | 1,740 | 1,860 | 2,004 | 2,189  | 2,306  | 2,449  | 2,896  | 3,355  | 3,833   | 3,991   | 4,501   |
| 9       | 1,100                           | 1,383 | 1,718 | 1,833 | 1,973 | 2,150  | 2,262  | 2,398  | 2,821  | 3,250  | 3,690   | 3,835   | 4,297   |
| 10      | 1,093                           | 1,372 | 1,700 | 1,812 | 1,948 | 2,120  | 2,228  | 2,359  | 2,764  | 3,169  | 3,581   | 3,716   | 4,144   |
| 11      | 1,088                           | 1,363 | 1,686 | 1,796 | 1,928 | 2,096  | 2,201  | 2,328  | 2,718  | 3,106  | 3,497   | 3,624   | 4,025   |
| 12      | 1,083                           | 1,356 | 1,674 | 1,782 | 1,912 | 2,076  | 2,179  | 2,303  | 2,681  | 3,055  | 3,428   | 3,550   | 3,930   |
| 13      | 1,079                           | 1,350 | 1,664 | 1,771 | 1,899 | 2,060  | 2,160  | 2,282  | 2,650  | 3,012  | 3,372   | 3,489   | 3,852   |
| 14      | 1,076                           | 1,345 | 1,656 | 1,761 | 1,887 | 2,046  | 2,145  | 2,264  | 2,624  | 2,977  | 3,326   | 3,438   | 3,787   |
| 15      | 1,074                           | 1,341 | 1,649 | 1,753 | 1,878 | 2,034  | 2,131  | 2,249  | 2,602  | 2,947  | 3,286   | 3,395   | 3,733   |
| 16      | 1,071                           | 1,337 | 1,642 | 1,746 | 1,869 | 2,024  | 2,120  | 2,235  | 2,583  | 2,921  | 3,252   | 3,358   | 3,686   |
| 17      | 1,069                           | 1,333 | 1,637 | 1,740 | 1,862 | 2,015  | 2,110  | 2,224  | 2,567  | 2,898  | 3,222   | 3,326   | 3,646   |
| 18      | 1,067                           | 1,330 | 1,632 | 1,734 | 1,855 | 2,007  | 2,101  | 2,214  | 2,552  | 2,878  | 3,197   | 3,298   | 3,610   |
| 19      | 1,066                           | 1,328 | 1,628 | 1,729 | 1,850 | 2,000  | 2,093  | 2,205  | 2,539  | 2,861  | 3,174   | 3,273   | 3,579   |
| 20      | 1,064                           | 1,325 | 1,624 | 1,725 | 1,844 | 1,994  | 2,086  | 2,197  | 2,528  | 2,845  | 3,153   | 3,251   | 3,552   |
| 21      | 1,063                           | 1,323 | 1,621 | 1,721 | 1,840 | 1,988  | 2,080  | 2,189  | 2,518  | 2,831  | 3,135   | 3,231   | 3,527   |
| 22      | 1,061                           | 1,321 | 1,618 | 1,717 | 1,835 | 1,983  | 2,074  | 2,183  | 2,508  | 2,819  | 3,119   | 3,214   | 3,505   |
| 23      | 1,060                           | 1,319 | 1,615 | 1,714 | 1,832 | 1,978  | 2,069  | 2,177  | 2,500  | 2,807  | 3,104   | 3,198   | 3,485   |
| 24      | 1,059                           | 1,318 | 1,612 | 1,711 | 1,828 | 1,974  | 2,064  | 2,172  | 2,492  | 2,797  | 3,091   | 3,183   | 3,467   |
| 25      | 1,058                           | 1,316 | 1,610 | 1,708 | 1,825 | 1,970  | 2,060  | 2,167  | 2,485  | 2,787  | 3,078   | 3,170   | 3,450   |
| 26      | 1,058                           | 1,315 | 1,608 | 1,706 | 1,822 | 1,967  | 2,056  | 2,162  | 2,479  | 2,779  | 3,067   | 3,158   | 3,435   |
| 27      | 1,057                           | 1,314 | 1,606 | 1,703 | 1,819 | 1,963  | 2,052  | 2,158  | 2,473  | 2,771  | 3,057   | 3,147   | 3,421   |
| 28      | 1,056                           | 1,313 | 1,604 | 1,701 | 1,817 | 1,960  | 2,048  | 2,154  | 2,467  | 2,763  | 3,047   | 3,136   | 3,408   |
| 29      | 1,055                           | 1,311 | 1,602 | 1,699 | 1,814 | 1,957  | 2,045  | 2,150  | 2,462  | 2,756  | 3,038   | 3,127   | 3,396   |
| 30      | 1,055                           | 1,310 | 1,600 | 1,697 | 1,812 | 1,955  | 2,042  | 2,147  | 2,457  | 2,750  | 3,030   | 3,118   | 3,385   |
| 31      | 1,054                           | 1,309 | 1,599 | 1,696 | 1,810 | 1,952  | 2,040  | 2,144  | 2,453  | 2,744  | 3,022   | 3,109   | 3,375   |
| 32      | 1,054                           | 1,309 | 1,597 | 1,694 | 1,808 | 1,950  | 2,037  | 2,141  | 2,449  | 2,738  | 3,015   | 3,102   | 3,365   |
| 33      | 1,053                           | 1,308 | 1,596 | 1,692 | 1,806 | 1,948  | 2,035  | 2,138  | 2,445  | 2,733  | 3,008   | 3,094   | 3,356   |
| 34      | 1,052                           | 1,307 | 1,595 | 1,691 | 1,805 | 1,946  | 2,032  | 2,136  | 2,441  | 2,728  | 3,002   | 3,088   | 3,348   |
| 35      | 1,052                           | 1,306 | 1,594 | 1,690 | 1,803 | 1,944  | 2,030  | 2,133  | 2,438  | 2,724  | 2,996   | 3,081   | 3,340   |

**Tabela 5**  
 Valores críticos  $f$  da distribuição  $F_{n,m}$   
 $P(F_{n,m} > f) = 0,05$



|    |   | GL numerador |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |       |  |  |  |  |
|----|---|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--|--|--|--|
|    |   | 1            | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     | 19     | 20     |       |  |  |  |  |
| 1  |   | 161,45       | 199,50 | 215,71 | 224,58 | 230,16 | 233,99 | 236,77 | 238,88 | 240,54 | 241,88 | 242,98 | 243,91 | 244,69 | 245,36 | 245,95 | 246,46 | 246,92 | 247,32 | 247,69 | 248,01 |       |  |  |  |  |
| 2  |   | 18,51        | 19,00  | 19,16  | 19,25  | 19,30  | 19,33  | 19,35  | 19,37  | 19,38  | 19,40  | 19,40  | 19,41  | 19,42  | 19,42  | 19,43  | 19,43  | 19,44  | 19,44  | 19,44  | 19,44  | 19,45 |  |  |  |  |
| 3  |   | 10,13        | 9,55   | 9,28   | 9,12   | 9,01   | 8,94   | 8,89   | 8,85   | 8,81   | 8,79   | 8,76   | 8,74   | 8,73   | 8,71   | 8,70   | 8,69   | 8,68   | 8,67   | 8,67   | 8,67   | 8,66  |  |  |  |  |
| 4  |   | 7,71         | 6,94   | 6,59   | 6,39   | 6,26   | 6,16   | 6,09   | 6,04   | 6,00   | 5,96   | 5,94   | 5,91   | 5,89   | 5,87   | 5,86   | 5,84   | 5,83   | 5,82   | 5,81   | 5,80   | 5,80  |  |  |  |  |
| 5  | G | 6,61         | 5,79   | 5,41   | 5,19   | 5,05   | 4,95   | 4,88   | 4,82   | 4,77   | 4,74   | 4,70   | 4,68   | 4,66   | 4,64   | 4,62   | 4,60   | 4,59   | 4,58   | 4,57   | 4,56   | 4,56  |  |  |  |  |
| 6  | L | 5,99         | 5,14   | 4,76   | 4,53   | 4,39   | 4,28   | 4,21   | 4,15   | 4,10   | 4,06   | 4,03   | 4,00   | 3,98   | 3,96   | 3,94   | 3,92   | 3,91   | 3,90   | 3,88   | 3,87   | 3,87  |  |  |  |  |
| 7  |   | 5,59         | 4,74   | 4,35   | 4,12   | 3,97   | 3,87   | 3,79   | 3,73   | 3,68   | 3,64   | 3,60   | 3,57   | 3,55   | 3,53   | 3,51   | 3,49   | 3,48   | 3,47   | 3,46   | 3,44   | 3,44  |  |  |  |  |
| 8  | d | 5,32         | 4,46   | 4,07   | 3,84   | 3,69   | 3,58   | 3,50   | 3,44   | 3,39   | 3,35   | 3,31   | 3,28   | 3,26   | 3,24   | 3,22   | 3,20   | 3,19   | 3,17   | 3,16   | 3,15   | 3,15  |  |  |  |  |
| 9  | e | 5,12         | 4,26   | 3,86   | 3,63   | 3,48   | 3,37   | 3,29   | 3,23   | 3,18   | 3,14   | 3,10   | 3,07   | 3,05   | 3,03   | 3,01   | 2,99   | 2,97   | 2,96   | 2,95   | 2,94   | 2,94  |  |  |  |  |
| 10 | n | 4,96         | 4,10   | 3,71   | 3,48   | 3,33   | 3,22   | 3,14   | 3,07   | 3,02   | 2,98   | 2,94   | 2,91   | 2,89   | 2,86   | 2,85   | 2,83   | 2,81   | 2,80   | 2,79   | 2,77   | 2,77  |  |  |  |  |
| 11 | o | 4,84         | 3,98   | 3,59   | 3,36   | 3,20   | 3,09   | 3,01   | 2,95   | 2,90   | 2,85   | 2,82   | 2,79   | 2,76   | 2,74   | 2,72   | 2,70   | 2,69   | 2,67   | 2,66   | 2,65   | 2,65  |  |  |  |  |
| 12 | m | 4,75         | 3,89   | 3,49   | 3,26   | 3,11   | 3,00   | 2,91   | 2,85   | 2,80   | 2,75   | 2,72   | 2,69   | 2,66   | 2,64   | 2,62   | 2,60   | 2,58   | 2,57   | 2,56   | 2,54   | 2,54  |  |  |  |  |
| 13 | i | 4,67         | 3,81   | 3,41   | 3,18   | 3,03   | 2,92   | 2,83   | 2,77   | 2,71   | 2,67   | 2,63   | 2,60   | 2,58   | 2,55   | 2,53   | 2,51   | 2,50   | 2,48   | 2,47   | 2,46   | 2,46  |  |  |  |  |
| 14 | n | 4,60         | 3,74   | 3,34   | 3,11   | 2,96   | 2,85   | 2,76   | 2,70   | 2,65   | 2,60   | 2,57   | 2,53   | 2,51   | 2,48   | 2,46   | 2,44   | 2,43   | 2,41   | 2,40   | 2,39   | 2,39  |  |  |  |  |
| 15 | a | 4,54         | 3,68   | 3,29   | 3,06   | 2,90   | 2,79   | 2,71   | 2,64   | 2,59   | 2,54   | 2,51   | 2,48   | 2,45   | 2,42   | 2,40   | 2,38   | 2,37   | 2,35   | 2,34   | 2,33   | 2,33  |  |  |  |  |
| 16 | d | 4,49         | 3,63   | 3,24   | 3,01   | 2,85   | 2,74   | 2,66   | 2,59   | 2,54   | 2,49   | 2,46   | 2,42   | 2,40   | 2,37   | 2,35   | 2,33   | 2,32   | 2,30   | 2,29   | 2,28   | 2,28  |  |  |  |  |
| 17 | o | 4,45         | 3,59   | 3,20   | 2,96   | 2,81   | 2,70   | 2,61   | 2,55   | 2,49   | 2,45   | 2,41   | 2,38   | 2,35   | 2,33   | 2,31   | 2,29   | 2,27   | 2,26   | 2,24   | 2,23   | 2,23  |  |  |  |  |
| 18 | r | 4,41         | 3,55   | 3,16   | 2,93   | 2,77   | 2,66   | 2,58   | 2,51   | 2,46   | 2,41   | 2,37   | 2,34   | 2,31   | 2,29   | 2,27   | 2,25   | 2,23   | 2,22   | 2,20   | 2,19   | 2,19  |  |  |  |  |
| 19 |   | 4,38         | 3,52   | 3,13   | 2,90   | 2,74   | 2,63   | 2,54   | 2,48   | 2,42   | 2,38   | 2,34   | 2,31   | 2,28   | 2,26   | 2,23   | 2,21   | 2,20   | 2,18   | 2,17   | 2,16   | 2,16  |  |  |  |  |
| 20 |   | 4,35         | 3,49   | 3,10   | 2,87   | 2,71   | 2,60   | 2,51   | 2,45   | 2,39   | 2,35   | 2,31   | 2,28   | 2,25   | 2,22   | 2,20   | 2,18   | 2,17   | 2,15   | 2,14   | 2,12   | 2,12  |  |  |  |  |
| 21 |   | 4,32         | 3,47   | 3,07   | 2,84   | 2,68   | 2,57   | 2,49   | 2,42   | 2,37   | 2,32   | 2,28   | 2,25   | 2,22   | 2,20   | 2,18   | 2,16   | 2,14   | 2,12   | 2,11   | 2,10   | 2,10  |  |  |  |  |
| 22 |   | 4,3          | 3,44   | 3,05   | 2,82   | 2,66   | 2,55   | 2,46   | 2,4    | 2,34   | 2,3    | 2,26   | 2,23   | 2,20   | 2,17   | 2,15   | 2,13   | 2,11   | 2,10   | 2,08   | 2,07   | 2,07  |  |  |  |  |
| 23 |   | 4,28         | 3,42   | 3,03   | 2,8    | 2,64   | 2,53   | 2,44   | 2,37   | 2,32   | 2,27   | 2,24   | 2,2    | 2,18   | 2,15   | 2,13   | 2,11   | 2,09   | 2,08   | 2,06   | 2,05   | 2,05  |  |  |  |  |
| 24 |   | 4,26         | 3,40   | 3,01   | 2,78   | 2,62   | 2,51   | 2,42   | 2,36   | 2,30   | 2,25   | 2,22   | 2,18   | 2,15   | 2,13   | 2,11   | 2,09   | 2,07   | 2,05   | 2,04   | 2,03   | 2,03  |  |  |  |  |
| 25 |   | 4,24         | 3,39   | 2,99   | 2,76   | 2,60   | 2,49   | 2,40   | 2,34   | 2,28   | 2,24   | 2,20   | 2,16   | 2,14   | 2,11   | 2,09   | 2,07   | 2,05   | 2,04   | 2,02   | 2,01   | 2,01  |  |  |  |  |

**Tabela 6**  
 Valores críticos  $f$  da distribuição  $F_{n,m}$   
 $P(F_{n,m} > f) = 0,025$



|    | GL numerador |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|----|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|    | 1            | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     | 19     | 20     |
| 1  | 647,79       | 799,50 | 864,16 | 899,58 | 921,85 | 937,11 | 948,22 | 956,66 | 963,28 | 968,63 | 973,03 | 976,71 | 979,84 | 982,53 | 984,87 | 986,92 | 988,73 | 990,35 | 991,80 | 993,10 |
| 2  | 38,51        | 39,00  | 39,17  | 39,25  | 39,30  | 39,33  | 39,36  | 39,37  | 39,39  | 39,40  | 39,41  | 39,41  | 39,42  | 39,43  | 39,43  | 39,44  | 39,44  | 39,44  | 39,45  | 39,45  |
| 3  | 17,44        | 16,04  | 15,44  | 15,10  | 14,88  | 14,73  | 14,62  | 14,54  | 14,47  | 14,42  | 14,37  | 14,34  | 14,30  | 14,28  | 14,25  | 14,23  | 14,21  | 14,20  | 14,18  | 14,17  |
| 4  | 12,22        | 10,65  | 9,98   | 9,60   | 9,36   | 9,20   | 9,07   | 8,98   | 8,90   | 8,84   | 8,79   | 8,75   | 8,71   | 8,68   | 8,66   | 8,63   | 8,61   | 8,59   | 8,58   | 8,56   |
| 5  | 10,01        | 8,43   | 7,76   | 7,39   | 7,15   | 6,98   | 6,85   | 6,76   | 6,68   | 6,62   | 6,57   | 6,52   | 6,49   | 6,46   | 6,43   | 6,40   | 6,38   | 6,36   | 6,34   | 6,33   |
| 6  | 8,81         | 7,26   | 6,60   | 6,23   | 5,99   | 5,82   | 5,70   | 5,60   | 5,52   | 5,46   | 5,41   | 5,37   | 5,33   | 5,30   | 5,27   | 5,24   | 5,22   | 5,20   | 5,18   | 5,17   |
| 7  | 8,07         | 6,54   | 5,89   | 5,52   | 5,29   | 5,12   | 4,99   | 4,90   | 4,82   | 4,76   | 4,71   | 4,67   | 4,63   | 4,60   | 4,57   | 4,54   | 4,52   | 4,50   | 4,48   | 4,47   |
| 8  | 7,57         | 6,06   | 5,42   | 5,05   | 4,82   | 4,65   | 4,53   | 4,43   | 4,36   | 4,30   | 4,24   | 4,20   | 4,16   | 4,13   | 4,10   | 4,08   | 4,05   | 4,03   | 4,02   | 4,00   |
| 9  | 7,21         | 5,71   | 5,08   | 4,72   | 4,48   | 4,32   | 4,20   | 4,10   | 4,03   | 3,96   | 3,91   | 3,87   | 3,83   | 3,80   | 3,77   | 3,74   | 3,72   | 3,70   | 3,68   | 3,67   |
| 10 | 6,94         | 5,46   | 4,83   | 4,47   | 4,24   | 4,07   | 3,95   | 3,85   | 3,78   | 3,72   | 3,66   | 3,62   | 3,58   | 3,55   | 3,52   | 3,50   | 3,47   | 3,45   | 3,44   | 3,42   |
| 11 | 6,72         | 5,26   | 4,63   | 4,28   | 4,04   | 3,88   | 3,76   | 3,66   | 3,59   | 3,53   | 3,47   | 3,43   | 3,39   | 3,36   | 3,33   | 3,30   | 3,28   | 3,26   | 3,24   | 3,23   |
| 12 | 6,55         | 5,10   | 4,47   | 4,12   | 3,89   | 3,73   | 3,61   | 3,51   | 3,44   | 3,37   | 3,32   | 3,28   | 3,24   | 3,21   | 3,18   | 3,15   | 3,13   | 3,11   | 3,09   | 3,07   |
| 13 | 6,41         | 4,97   | 4,35   | 4,00   | 3,77   | 3,60   | 3,48   | 3,39   | 3,31   | 3,25   | 3,20   | 3,15   | 3,12   | 3,08   | 3,05   | 3,03   | 3,00   | 2,98   | 2,96   | 2,95   |
| 14 | 6,30         | 4,86   | 4,24   | 3,89   | 3,66   | 3,50   | 3,38   | 3,29   | 3,21   | 3,15   | 3,09   | 3,05   | 3,01   | 2,98   | 2,95   | 2,92   | 2,90   | 2,88   | 2,86   | 2,84   |
| 15 | 6,20         | 4,77   | 4,15   | 3,80   | 3,58   | 3,41   | 3,29   | 3,20   | 3,12   | 3,06   | 3,01   | 2,96   | 2,92   | 2,89   | 2,86   | 2,84   | 2,81   | 2,79   | 2,77   | 2,76   |
| 16 | 6,12         | 4,69   | 4,08   | 3,73   | 3,50   | 3,34   | 3,22   | 3,12   | 3,05   | 2,99   | 2,93   | 2,89   | 2,85   | 2,82   | 2,79   | 2,76   | 2,74   | 2,72   | 2,70   | 2,68   |
| 17 | 6,04         | 4,62   | 4,01   | 3,66   | 3,44   | 3,28   | 3,16   | 3,06   | 2,98   | 2,92   | 2,87   | 2,82   | 2,79   | 2,75   | 2,72   | 2,70   | 2,67   | 2,65   | 2,63   | 2,62   |
| 18 | 5,98         | 4,56   | 3,95   | 3,61   | 3,38   | 3,22   | 3,10   | 3,01   | 2,93   | 2,87   | 2,81   | 2,77   | 2,73   | 2,70   | 2,67   | 2,64   | 2,62   | 2,60   | 2,58   | 2,56   |
| 19 | 5,92         | 4,51   | 3,90   | 3,56   | 3,33   | 3,17   | 3,05   | 2,96   | 2,88   | 2,82   | 2,76   | 2,72   | 2,68   | 2,65   | 2,62   | 2,59   | 2,57   | 2,55   | 2,53   | 2,51   |
| 20 | 5,87         | 4,46   | 3,86   | 3,51   | 3,29   | 3,13   | 3,01   | 2,91   | 2,84   | 2,77   | 2,72   | 2,68   | 2,64   | 2,60   | 2,57   | 2,55   | 2,52   | 2,5    | 2,48   | 2,46   |
| 21 | 5,83         | 4,42   | 3,82   | 3,48   | 3,25   | 3,09   | 2,97   | 2,87   | 2,80   | 2,73   | 2,68   | 2,64   | 2,60   | 2,56   | 2,53   | 2,51   | 2,48   | 2,46   | 2,44   | 2,42   |
| 22 | 5,79         | 4,38   | 3,78   | 3,44   | 3,22   | 3,05   | 2,93   | 2,84   | 2,76   | 2,70   | 2,65   | 2,60   | 2,56   | 2,53   | 2,50   | 2,47   | 2,45   | 2,43   | 2,41   | 2,39   |
| 23 | 5,75         | 4,35   | 3,75   | 3,41   | 3,18   | 3,02   | 2,90   | 2,81   | 2,73   | 2,67   | 2,62   | 2,57   | 2,53   | 2,50   | 2,47   | 2,44   | 2,42   | 2,39   | 2,37   | 2,36   |
| 24 | 5,72         | 4,32   | 3,72   | 3,38   | 3,15   | 2,99   | 2,87   | 2,78   | 2,70   | 2,64   | 2,59   | 2,54   | 2,50   | 2,47   | 2,44   | 2,41   | 2,39   | 2,36   | 2,35   | 2,33   |
| 25 | 5,69         | 4,29   | 3,69   | 3,35   | 3,13   | 2,97   | 2,85   | 2,75   | 2,68   | 2,61   | 2,56   | 2,51   | 2,48   | 2,44   | 2,41   | 2,38   | 2,36   | 2,34   | 2,32   | 2,30   |



Tabela 7: Valores críticos  $q_{p,v}$  da amplitude studentized –  $\alpha = 0,05$

| $v$ | $p$   |       |       |        |        |        |        |        |        |        |        |
|-----|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
|     | 2     | 3     | 4     | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     |
| 2   | 6,080 | 8,331 | 9,799 | 10,881 | 11,734 | 12,435 | 13,028 | 13,542 | 13,994 | 14,396 | 14,759 |
| 3   | 4,501 | 5,910 | 6,825 | 7,502  | 8,037  | 8,478  | 8,852  | 9,177  | 9,462  | 9,717  | 9,946  |
| 4   | 3,927 | 5,040 | 5,757 | 6,287  | 6,706  | 7,053  | 7,347  | 7,602  | 7,826  | 8,027  | 8,208  |
| 5   | 3,635 | 4,602 | 5,218 | 5,673  | 6,033  | 6,330  | 6,582  | 6,801  | 6,995  | 7,167  | 7,323  |
| 6   | 3,460 | 4,339 | 4,896 | 5,305  | 5,628  | 5,895  | 6,122  | 6,319  | 6,493  | 6,649  | 6,789  |
| 7   | 3,344 | 4,165 | 4,681 | 5,060  | 5,359  | 5,606  | 5,815  | 5,997  | 6,158  | 6,302  | 6,431  |
| 8   | 3,261 | 4,041 | 4,529 | 4,886  | 5,167  | 5,399  | 5,596  | 5,767  | 5,918  | 6,053  | 6,175  |
| 9   | 3,199 | 3,948 | 4,415 | 4,755  | 5,024  | 5,244  | 5,432  | 5,595  | 5,738  | 5,867  | 5,983  |
| 10  | 3,151 | 3,877 | 4,327 | 4,654  | 4,912  | 5,124  | 5,304  | 5,460  | 5,598  | 5,722  | 5,833  |
| 11  | 3,113 | 3,820 | 4,256 | 4,574  | 4,823  | 5,028  | 5,202  | 5,353  | 5,486  | 5,605  | 5,713  |
| 12  | 3,081 | 3,773 | 4,199 | 4,508  | 4,750  | 4,950  | 5,119  | 5,265  | 5,395  | 5,510  | 5,615  |
| 13  | 3,055 | 3,734 | 4,151 | 4,453  | 4,690  | 4,884  | 5,049  | 5,192  | 5,318  | 5,431  | 5,533  |
| 14  | 3,033 | 3,701 | 4,111 | 4,407  | 4,639  | 4,829  | 4,990  | 5,130  | 5,253  | 5,364  | 5,463  |
| 15  | 3,014 | 3,673 | 4,076 | 4,367  | 4,595  | 4,782  | 4,940  | 5,077  | 5,198  | 5,306  | 5,403  |
| 16  | 2,998 | 3,649 | 4,046 | 4,333  | 4,557  | 4,741  | 4,896  | 5,031  | 5,150  | 5,256  | 5,352  |
| 17  | 2,984 | 3,628 | 4,020 | 4,303  | 4,524  | 4,705  | 4,858  | 4,991  | 5,108  | 5,212  | 5,306  |
| 18  | 2,971 | 3,609 | 3,997 | 4,276  | 4,494  | 4,673  | 4,824  | 4,955  | 5,071  | 5,173  | 5,266  |
| 19  | 2,960 | 3,593 | 3,977 | 4,253  | 4,468  | 4,645  | 4,794  | 4,924  | 5,037  | 5,139  | 5,231  |
| 20  | 2,950 | 3,578 | 3,958 | 4,232  | 4,445  | 4,620  | 4,768  | 4,895  | 5,008  | 5,108  | 5,199  |
| 21  | 2,941 | 3,565 | 3,942 | 4,213  | 4,424  | 4,597  | 4,743  | 4,870  | 4,981  | 5,081  | 5,170  |
| 22  | 2,933 | 3,553 | 3,927 | 4,196  | 4,405  | 4,577  | 4,722  | 4,847  | 4,957  | 5,056  | 5,144  |
| 23  | 2,926 | 3,542 | 3,914 | 4,180  | 4,388  | 4,558  | 4,702  | 4,826  | 4,935  | 5,033  | 5,121  |
| 24  | 2,919 | 3,532 | 3,901 | 4,166  | 4,373  | 4,541  | 4,684  | 4,807  | 4,915  | 5,012  | 5,099  |
| 25  | 2,913 | 3,523 | 3,890 | 4,153  | 4,358  | 4,526  | 4,667  | 4,789  | 4,897  | 4,993  | 5,079  |
| 26  | 2,907 | 3,514 | 3,880 | 4,141  | 4,345  | 4,511  | 4,652  | 4,773  | 4,880  | 4,975  | 5,061  |
| 27  | 2,902 | 3,506 | 3,870 | 4,130  | 4,333  | 4,498  | 4,638  | 4,758  | 4,864  | 4,959  | 5,044  |
| 28  | 2,784 | 3,332 | 3,655 | 3,883  | 4,058  | 4,200  | 4,319  | 4,421  | 4,511  | 4,590  | 4,662  |
| 29  | 2,892 | 3,493 | 3,853 | 4,111  | 4,311  | 4,475  | 4,613  | 4,732  | 4,837  | 4,930  | 5,014  |
| 30  | 2,897 | 3,499 | 3,861 | 4,120  | 4,322  | 4,486  | 4,625  | 4,745  | 4,850  | 4,944  | 5,029  |
| 31  | 2,892 | 3,493 | 3,853 | 4,111  | 4,311  | 4,475  | 4,613  | 4,732  | 4,837  | 4,930  | 5,014  |
| 32  | 2,888 | 3,486 | 3,845 | 4,102  | 4,301  | 4,464  | 4,601  | 4,720  | 4,824  | 4,917  | 5,001  |
| 33  | 2,884 | 3,481 | 3,838 | 4,094  | 4,292  | 4,454  | 4,591  | 4,709  | 4,812  | 4,905  | 4,988  |
| 34  | 2,881 | 3,475 | 3,832 | 4,086  | 4,284  | 4,445  | 4,581  | 4,698  | 4,802  | 4,894  | 4,976  |
| 35  | 2,871 | 3,461 | 3,814 | 4,066  | 4,261  | 4,421  | 4,555  | 4,671  | 4,773  | 4,863  | 4,945  |
| 36  | 2,868 | 3,457 | 3,809 | 4,060  | 4,255  | 4,414  | 4,547  | 4,663  | 4,764  | 4,855  | 4,936  |
| 37  | 2,865 | 3,453 | 3,804 | 4,054  | 4,249  | 4,407  | 4,540  | 4,655  | 4,756  | 4,846  | 4,927  |
| 38  | 2,863 | 3,449 | 3,799 | 4,049  | 4,243  | 4,400  | 4,533  | 4,648  | 4,749  | 4,838  | 4,919  |
| 39  | 2,861 | 3,445 | 3,795 | 4,044  | 4,237  | 4,394  | 4,527  | 4,641  | 4,741  | 4,831  | 4,911  |
| 40  | 2,858 | 3,442 | 3,791 | 4,039  | 4,232  | 4,388  | 4,521  | 4,634  | 4,735  | 4,824  | 4,904  |
| 50  | 2,841 | 3,416 | 3,758 | 4,002  | 4,190  | 4,344  | 4,473  | 4,584  | 4,681  | 4,768  | 4,846  |
| 60  | 2,829 | 3,399 | 3,737 | 3,977  | 4,163  | 4,314  | 4,441  | 4,550  | 4,646  | 4,732  | 4,808  |
| 70  | 2,821 | 3,386 | 3,722 | 3,960  | 4,144  | 4,293  | 4,419  | 4,527  | 4,621  | 4,706  | 4,781  |
| 80  | 2,814 | 3,377 | 3,711 | 3,947  | 4,129  | 4,277  | 4,402  | 4,509  | 4,603  | 4,686  | 4,761  |
| 90  | 2,810 | 3,370 | 3,702 | 3,937  | 4,118  | 4,265  | 4,389  | 4,495  | 4,588  | 4,671  | 4,746  |
| 100 | 2,806 | 3,365 | 3,695 | 3,929  | 4,109  | 4,256  | 4,379  | 4,484  | 4,577  | 4,659  | 4,733  |

Fonte: Valores gerados com a função ptukey do R

Tabela 8: Valores críticos  $q_{p,v}$  da amplitude studentized –  $\alpha = 0,01$

| v   | p      |        |        |        |        |        |        |        |        |        |        |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|     | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     |
| 2   | 13,902 | 19,016 | 22,564 | 25,372 | 27,757 | 29,856 | 31,730 | 33,412 | 34,926 | 36,293 | 37,533 |
| 3   | 8,260  | 10,620 | 12,170 | 13,322 | 14,239 | 14,998 | 15,646 | 16,212 | 16,713 | 17,164 | 17,573 |
| 4   | 6,511  | 8,120  | 9,173  | 9,958  | 10,583 | 11,101 | 11,542 | 11,925 | 12,263 | 12,565 | 12,839 |
| 5   | 5,702  | 6,976  | 7,804  | 8,421  | 8,913  | 9,321  | 9,669  | 9,971  | 10,239 | 10,479 | 10,696 |
| 6   | 5,243  | 6,331  | 7,033  | 7,556  | 7,972  | 8,318  | 8,612  | 8,869  | 9,097  | 9,300  | 9,485  |
| 7   | 4,949  | 5,919  | 6,542  | 7,005  | 7,373  | 7,678  | 7,939  | 8,166  | 8,367  | 8,548  | 8,711  |
| 8   | 4,745  | 5,635  | 6,204  | 6,625  | 6,959  | 7,237  | 7,474  | 7,680  | 7,863  | 8,027  | 8,176  |
| 9   | 4,596  | 5,428  | 5,957  | 6,347  | 6,657  | 6,915  | 7,134  | 7,325  | 7,494  | 7,646  | 7,784  |
| 10  | 4,482  | 5,270  | 5,769  | 6,136  | 6,428  | 6,669  | 6,875  | 7,054  | 7,213  | 7,356  | 7,485  |
| 11  | 4,392  | 5,146  | 5,621  | 5,970  | 6,247  | 6,476  | 6,671  | 6,841  | 6,992  | 7,127  | 7,250  |
| 12  | 4,320  | 5,046  | 5,502  | 5,836  | 6,101  | 6,320  | 6,507  | 6,670  | 6,814  | 6,943  | 7,060  |
| 13  | 4,260  | 4,964  | 5,404  | 5,726  | 5,981  | 6,192  | 6,372  | 6,528  | 6,666  | 6,791  | 6,903  |
| 14  | 4,210  | 4,895  | 5,322  | 5,634  | 5,881  | 6,085  | 6,258  | 6,409  | 6,543  | 6,663  | 6,772  |
| 15  | 4,167  | 4,836  | 5,252  | 5,556  | 5,796  | 5,994  | 6,162  | 6,309  | 6,438  | 6,555  | 6,660  |
| 16  | 4,131  | 4,786  | 5,192  | 5,489  | 5,722  | 5,915  | 6,079  | 6,222  | 6,348  | 6,461  | 6,564  |
| 17  | 4,099  | 4,742  | 5,140  | 5,430  | 5,659  | 5,847  | 6,007  | 6,147  | 6,270  | 6,380  | 6,480  |
| 18  | 4,071  | 4,703  | 5,094  | 5,379  | 5,603  | 5,787  | 5,944  | 6,081  | 6,201  | 6,309  | 6,407  |
| 19  | 4,046  | 4,669  | 5,054  | 5,334  | 5,553  | 5,735  | 5,889  | 6,022  | 6,141  | 6,246  | 6,342  |
| 20  | 4,024  | 4,639  | 5,018  | 5,293  | 5,510  | 5,688  | 5,839  | 5,970  | 6,086  | 6,190  | 6,285  |
| 21  | 4,004  | 4,612  | 4,986  | 5,257  | 5,470  | 5,646  | 5,794  | 5,924  | 6,038  | 6,140  | 6,233  |
| 22  | 3,986  | 4,588  | 4,957  | 5,225  | 5,435  | 5,608  | 5,754  | 5,882  | 5,994  | 6,095  | 6,186  |
| 23  | 3,970  | 4,566  | 4,931  | 5,195  | 5,403  | 5,573  | 5,718  | 5,844  | 5,955  | 6,054  | 6,144  |
| 24  | 3,955  | 4,546  | 4,907  | 5,168  | 5,373  | 5,542  | 5,685  | 5,809  | 5,919  | 6,017  | 6,105  |
| 25  | 3,942  | 4,527  | 4,885  | 5,144  | 5,347  | 5,513  | 5,655  | 5,778  | 5,886  | 5,983  | 6,070  |
| 26  | 3,930  | 4,510  | 4,865  | 5,121  | 5,322  | 5,487  | 5,627  | 5,749  | 5,856  | 5,951  | 6,038  |
| 27  | 3,918  | 4,495  | 4,847  | 5,101  | 5,300  | 5,463  | 5,602  | 5,722  | 5,828  | 5,923  | 6,008  |
| 28  | 3,908  | 4,481  | 4,830  | 5,082  | 5,279  | 5,441  | 5,578  | 5,697  | 5,802  | 5,896  | 5,981  |
| 29  | 3,898  | 4,467  | 4,814  | 5,064  | 5,260  | 5,420  | 5,556  | 5,674  | 5,778  | 5,871  | 5,955  |
| 30  | 3,889  | 4,455  | 4,799  | 5,048  | 5,242  | 5,401  | 5,536  | 5,653  | 5,756  | 5,848  | 5,932  |
| 31  | 3,881  | 4,443  | 4,786  | 5,032  | 5,225  | 5,383  | 5,517  | 5,633  | 5,736  | 5,827  | 5,910  |
| 32  | 3,873  | 4,433  | 4,773  | 5,018  | 5,210  | 5,367  | 5,500  | 5,615  | 5,716  | 5,807  | 5,889  |
| 33  | 3,865  | 4,423  | 4,761  | 5,005  | 5,195  | 5,351  | 5,483  | 5,598  | 5,698  | 5,789  | 5,870  |
| 34  | 3,859  | 4,413  | 4,750  | 4,992  | 5,181  | 5,336  | 5,468  | 5,581  | 5,682  | 5,771  | 5,852  |
| 35  | 3,852  | 4,404  | 4,739  | 4,980  | 5,169  | 5,323  | 5,453  | 5,566  | 5,666  | 5,755  | 5,835  |
| 36  | 3,846  | 4,396  | 4,729  | 4,969  | 5,156  | 5,310  | 5,439  | 5,552  | 5,651  | 5,739  | 5,819  |
| 37  | 3,840  | 4,388  | 4,720  | 4,959  | 5,145  | 5,298  | 5,427  | 5,538  | 5,637  | 5,725  | 5,804  |
| 38  | 3,835  | 4,381  | 4,711  | 4,949  | 5,134  | 5,286  | 5,414  | 5,526  | 5,623  | 5,711  | 5,790  |
| 39  | 3,830  | 4,374  | 4,703  | 4,940  | 5,124  | 5,275  | 5,403  | 5,513  | 5,611  | 5,698  | 5,776  |
| 40  | 3,825  | 4,367  | 4,695  | 4,931  | 5,114  | 5,265  | 5,392  | 5,502  | 5,599  | 5,685  | 5,764  |
| 50  | 3,787  | 4,316  | 4,634  | 4,863  | 5,040  | 5,185  | 5,308  | 5,414  | 5,507  | 5,590  | 5,665  |
| 60  | 3,762  | 4,282  | 4,594  | 4,818  | 4,991  | 5,133  | 5,253  | 5,356  | 5,447  | 5,528  | 5,601  |
| 70  | 3,745  | 4,258  | 4,566  | 4,786  | 4,957  | 5,096  | 5,214  | 5,315  | 5,404  | 5,483  | 5,555  |
| 80  | 3,732  | 4,241  | 4,545  | 4,763  | 4,931  | 5,069  | 5,185  | 5,284  | 5,372  | 5,451  | 5,521  |
| 90  | 3,722  | 4,227  | 4,529  | 4,745  | 4,911  | 5,048  | 5,162  | 5,261  | 5,348  | 5,425  | 5,495  |
| 100 | 3,714  | 4,216  | 4,516  | 4,730  | 4,896  | 5,031  | 5,144  | 5,242  | 5,328  | 5,405  | 5,474  |

Fonte: Valores gerados com a função ptukey do R

Tabela 9: Valores críticos  $r_{p, \nu, 0,05}$  para o teste de Duncan -  $\alpha = 0,05$

| gl       | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     | 19     | 20     |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1        | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 | 17,969 |
| 2        | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  | 6,085  |
| 3        | 4,501  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  | 4,516  |
| 4        | 3,926  | 4,013  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  | 4,033  |
| 5        | 3,635  | 3,749  | 3,796  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  | 3,814  |
| 6        | 3,460  | 3,586  | 3,649  | 3,680  | 3,694  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  | 3,697  |
| 7        | 3,344  | 3,477  | 3,548  | 3,588  | 3,611  | 3,622  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  | 3,625  |
| 8        | 3,261  | 3,398  | 3,475  | 3,521  | 3,549  | 3,566  | 3,575  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  | 3,579  |
| 9        | 3,199  | 3,339  | 3,420  | 3,470  | 3,502  | 3,523  | 3,536  | 3,544  | 3,547  | 3,547  | 3,547  | 3,547  | 3,547  | 3,547  | 3,547  | 3,547  | 3,547  | 3,547  | 3,547  |
| 10       | 3,151  | 3,293  | 3,376  | 3,430  | 3,465  | 3,489  | 3,505  | 3,516  | 3,522  | 3,525  | 3,525  | 3,525  | 3,525  | 3,525  | 3,525  | 3,525  | 3,525  | 3,525  | 3,525  |
| 11       | 3,113  | 3,256  | 3,341  | 3,397  | 3,435  | 3,462  | 3,480  | 3,493  | 3,501  | 3,506  | 3,509  | 3,510  | 3,510  | 3,510  | 3,510  | 3,510  | 3,510  | 3,510  | 3,510  |
| 12       | 3,081  | 3,225  | 3,312  | 3,370  | 3,410  | 3,439  | 3,459  | 3,474  | 3,484  | 3,491  | 3,495  | 3,498  | 3,498  | 3,498  | 3,498  | 3,498  | 3,498  | 3,498  | 3,498  |
| 13       | 3,055  | 3,200  | 3,288  | 3,348  | 3,389  | 3,419  | 3,441  | 3,458  | 3,470  | 3,478  | 3,484  | 3,488  | 3,490  | 3,490  | 3,490  | 3,490  | 3,490  | 3,490  | 3,490  |
| 14       | 3,033  | 3,178  | 3,268  | 3,328  | 3,371  | 3,403  | 3,426  | 3,444  | 3,457  | 3,467  | 3,474  | 3,479  | 3,482  | 3,484  | 3,484  | 3,484  | 3,484  | 3,484  | 3,484  |
| 15       | 3,014  | 3,160  | 3,250  | 3,312  | 3,356  | 3,389  | 3,413  | 3,432  | 3,446  | 3,457  | 3,465  | 3,471  | 3,476  | 3,478  | 3,480  | 3,480  | 3,480  | 3,480  | 3,480  |
| 16       | 2,998  | 3,144  | 3,235  | 3,297  | 3,343  | 3,376  | 3,402  | 3,422  | 3,437  | 3,449  | 3,458  | 3,465  | 3,470  | 3,473  | 3,476  | 3,477  | 3,477  | 3,477  | 3,477  |
| 17       | 2,984  | 3,130  | 3,222  | 3,285  | 3,331  | 3,365  | 3,392  | 3,412  | 3,429  | 3,441  | 3,451  | 3,459  | 3,465  | 3,469  | 3,472  | 3,474  | 3,475  | 3,475  | 3,475  |
| 18       | 2,971  | 3,117  | 3,210  | 3,274  | 3,320  | 3,356  | 3,383  | 3,404  | 3,421  | 3,435  | 3,445  | 3,454  | 3,460  | 3,465  | 3,469  | 3,472  | 3,473  | 3,474  | 3,474  |
| 19       | 2,960  | 3,106  | 3,199  | 3,264  | 3,311  | 3,347  | 3,375  | 3,397  | 3,415  | 3,429  | 3,440  | 3,449  | 3,456  | 3,462  | 3,466  | 3,469  | 3,472  | 3,473  | 3,474  |
| 20       | 2,950  | 3,097  | 3,190  | 3,255  | 3,303  | 3,339  | 3,368  | 3,390  | 3,409  | 3,423  | 3,435  | 3,445  | 3,452  | 3,459  | 3,463  | 3,467  | 3,470  | 3,472  | 3,473  |
| 21       | 2,941  | 3,088  | 3,181  | 3,247  | 3,295  | 3,332  | 3,361  | 3,385  | 3,403  | 3,418  | 3,431  | 3,441  | 3,449  | 3,456  | 3,461  | 3,465  | 3,469  | 3,471  | 3,473  |
| 22       | 2,933  | 3,080  | 3,173  | 3,239  | 3,288  | 3,326  | 3,355  | 3,379  | 3,398  | 3,414  | 3,427  | 3,437  | 3,446  | 3,453  | 3,459  | 3,464  | 3,467  | 3,470  | 3,472  |
| 23       | 2,926  | 3,072  | 3,166  | 3,233  | 3,282  | 3,320  | 3,350  | 3,374  | 3,394  | 3,410  | 3,423  | 3,434  | 3,443  | 3,451  | 3,457  | 3,462  | 3,466  | 3,469  | 3,472  |
| 24       | 2,919  | 3,066  | 3,160  | 3,226  | 3,276  | 3,315  | 3,345  | 3,370  | 3,390  | 3,406  | 3,420  | 3,431  | 3,441  | 3,449  | 3,455  | 3,461  | 3,465  | 3,469  | 3,472  |
| 25       | 2,913  | 3,059  | 3,154  | 3,221  | 3,271  | 3,310  | 3,341  | 3,366  | 3,386  | 3,403  | 3,417  | 3,429  | 3,439  | 3,447  | 3,454  | 3,459  | 3,464  | 3,468  | 3,471  |
| 26       | 2,907  | 3,054  | 3,149  | 3,216  | 3,266  | 3,305  | 3,336  | 3,362  | 3,382  | 3,400  | 3,414  | 3,426  | 3,436  | 3,445  | 3,452  | 3,458  | 3,463  | 3,468  | 3,471  |
| 27       | 2,902  | 3,049  | 3,144  | 3,211  | 3,262  | 3,301  | 3,332  | 3,358  | 3,379  | 3,397  | 3,412  | 3,424  | 3,434  | 3,443  | 3,451  | 3,457  | 3,463  | 3,467  | 3,471  |
| 28       | 2,897  | 3,044  | 3,139  | 3,206  | 3,257  | 3,297  | 3,329  | 3,355  | 3,376  | 3,394  | 3,409  | 3,422  | 3,433  | 3,442  | 3,450  | 3,456  | 3,462  | 3,467  | 3,470  |
| 29       | 2,892  | 3,039  | 3,135  | 3,202  | 3,253  | 3,293  | 3,326  | 3,352  | 3,373  | 3,392  | 3,407  | 3,420  | 3,431  | 3,440  | 3,448  | 3,455  | 3,461  | 3,466  | 3,470  |
| 30       | 2,888  | 3,035  | 3,131  | 3,199  | 3,250  | 3,290  | 3,322  | 3,349  | 3,371  | 3,389  | 3,405  | 3,418  | 3,429  | 3,439  | 3,447  | 3,454  | 3,460  | 3,466  | 3,470  |
| 35       | 2,871  | 3,018  | 3,114  | 3,183  | 3,235  | 3,276  | 3,309  | 3,337  | 3,360  | 3,379  | 3,396  | 3,410  | 3,423  | 3,433  | 3,443  | 3,451  | 3,458  | 3,464  | 3,469  |
| 40       | 2,858  | 3,005  | 3,102  | 3,171  | 3,224  | 3,266  | 3,300  | 3,328  | 3,352  | 3,372  | 3,389  | 3,404  | 3,418  | 3,429  | 3,439  | 3,448  | 3,456  | 3,463  | 3,469  |
| 60       | 2,829  | 2,976  | 3,073  | 3,143  | 3,198  | 3,241  | 3,277  | 3,307  | 3,333  | 3,355  | 3,374  | 3,391  | 3,406  | 3,419  | 3,431  | 3,441  | 3,451  | 3,460  | 3,468  |
| 80       | 2,814  | 2,961  | 3,059  | 3,130  | 3,185  | 3,229  | 3,266  | 3,297  | 3,323  | 3,346  | 3,366  | 3,384  | 3,400  | 3,414  | 3,427  | 3,438  | 3,449  | 3,458  | 3,467  |
| 120      | 2,800  | 2,947  | 3,045  | 3,116  | 3,172  | 3,217  | 3,254  | 3,286  | 3,313  | 3,337  | 3,358  | 3,377  | 3,394  | 3,409  | 3,423  | 3,435  | 3,446  | 3,457  | 3,466  |
| 240      | 2,786  | 2,933  | 3,031  | 3,103  | 3,159  | 3,205  | 3,243  | 3,276  | 3,304  | 3,329  | 3,350  | 3,370  | 3,388  | 3,404  | 3,418  | 3,432  | 3,444  | 3,455  | 3,466  |
| $\infty$ | 2,772  | 2,918  | 3,017  | 3,089  | 3,146  | 3,193  | 3,232  | 3,265  | 3,294  | 3,320  | 3,343  | 3,363  | 3,382  | 3,399  | 3,414  | 3,428  | 3,442  | 3,454  | 3,466  |

Fonte: <http://www2.accsnet.ne.jp/miwa/probcalc/duncan/index.html>

Tabela 10: Valores críticos  $t_{p,v,0.01}$  para o teste de Duncan -  $\alpha = 0,01$

| gl  | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     | 19     | 20     |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1   | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 | 90,024 |
| 2   | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 | 14,036 |
| 3   | 8,260  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  | 8,321  |
| 4   | 6,511  | 6,677  | 6,740  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  | 6,755  |
| 5   | 5,702  | 5,893  | 5,989  | 6,040  | 6,065  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  | 6,074  |
| 6   | 5,243  | 5,439  | 5,549  | 5,614  | 5,655  | 5,680  | 5,694  | 5,701  | 5,703  | 5,703  | 5,703  | 5,703  | 5,703  | 5,703  | 5,703  | 5,703  | 5,703  | 5,703  | 5,703  |
| 7   | 4,949  | 5,145  | 5,260  | 5,333  | 5,383  | 5,416  | 5,439  | 5,454  | 5,464  | 5,470  | 5,472  | 5,472  | 5,472  | 5,472  | 5,472  | 5,472  | 5,472  | 5,472  | 5,472  |
| 8   | 4,745  | 4,939  | 5,056  | 5,134  | 5,189  | 5,227  | 5,256  | 5,276  | 5,291  | 5,302  | 5,309  | 5,313  | 5,316  | 5,317  | 5,317  | 5,317  | 5,317  | 5,317  | 5,317  |
| 9   | 4,596  | 4,787  | 4,906  | 4,986  | 5,043  | 5,086  | 5,117  | 5,142  | 5,160  | 5,174  | 5,185  | 5,193  | 5,199  | 5,202  | 5,205  | 5,206  | 5,206  | 5,206  | 5,206  |
| 10  | 4,482  | 4,671  | 4,789  | 4,871  | 4,931  | 4,975  | 5,010  | 5,036  | 5,058  | 5,074  | 5,087  | 5,098  | 5,106  | 5,112  | 5,117  | 5,120  | 5,122  | 5,123  | 5,124  |
| 11  | 4,392  | 4,579  | 4,697  | 4,780  | 4,841  | 4,887  | 4,923  | 4,952  | 4,975  | 4,994  | 5,009  | 5,021  | 5,031  | 5,039  | 5,045  | 5,050  | 5,054  | 5,057  | 5,059  |
| 12  | 4,320  | 4,504  | 4,622  | 4,705  | 4,767  | 4,815  | 4,852  | 4,882  | 4,907  | 4,927  | 4,944  | 4,957  | 4,969  | 4,978  | 4,986  | 4,993  | 4,998  | 5,002  | 5,005  |
| 13  | 4,260  | 4,442  | 4,560  | 4,643  | 4,706  | 4,754  | 4,793  | 4,824  | 4,850  | 4,871  | 4,889  | 4,904  | 4,917  | 4,927  | 4,936  | 4,944  | 4,950  | 4,955  | 4,960  |
| 14  | 4,210  | 4,391  | 4,508  | 4,591  | 4,654  | 4,703  | 4,743  | 4,775  | 4,802  | 4,824  | 4,843  | 4,859  | 4,872  | 4,884  | 4,894  | 4,902  | 4,909  | 4,916  | 4,921  |
| 15  | 4,167  | 4,346  | 4,463  | 4,547  | 4,610  | 4,660  | 4,700  | 4,733  | 4,760  | 4,783  | 4,803  | 4,820  | 4,834  | 4,846  | 4,857  | 4,866  | 4,874  | 4,881  | 4,887  |
| 16  | 4,131  | 4,308  | 4,425  | 4,508  | 4,572  | 4,622  | 4,662  | 4,696  | 4,724  | 4,748  | 4,768  | 4,785  | 4,800  | 4,813  | 4,825  | 4,835  | 4,843  | 4,851  | 4,858  |
| 17  | 4,099  | 4,275  | 4,391  | 4,474  | 4,538  | 4,589  | 4,630  | 4,664  | 4,692  | 4,717  | 4,737  | 4,755  | 4,771  | 4,785  | 4,797  | 4,807  | 4,816  | 4,824  | 4,832  |
| 18  | 4,071  | 4,246  | 4,361  | 4,445  | 4,509  | 4,559  | 4,601  | 4,635  | 4,664  | 4,689  | 4,710  | 4,729  | 4,745  | 4,759  | 4,771  | 4,782  | 4,792  | 4,801  | 4,808  |
| 19  | 4,046  | 4,220  | 4,335  | 4,418  | 4,483  | 4,533  | 4,575  | 4,610  | 4,639  | 4,664  | 4,686  | 4,705  | 4,722  | 4,736  | 4,749  | 4,760  | 4,771  | 4,780  | 4,788  |
| 20  | 4,024  | 4,197  | 4,312  | 4,395  | 4,459  | 4,510  | 4,552  | 4,587  | 4,617  | 4,642  | 4,664  | 4,684  | 4,701  | 4,716  | 4,729  | 4,741  | 4,751  | 4,761  | 4,769  |
| 21  | 4,004  | 4,177  | 4,291  | 4,374  | 4,438  | 4,489  | 4,531  | 4,567  | 4,597  | 4,622  | 4,645  | 4,664  | 4,682  | 4,697  | 4,711  | 4,723  | 4,734  | 4,743  | 4,752  |
| 22  | 3,986  | 4,158  | 4,272  | 4,355  | 4,419  | 4,470  | 4,513  | 4,548  | 4,578  | 4,604  | 4,627  | 4,647  | 4,664  | 4,680  | 4,694  | 4,706  | 4,718  | 4,728  | 4,737  |
| 23  | 3,970  | 4,141  | 4,254  | 4,337  | 4,402  | 4,453  | 4,496  | 4,531  | 4,562  | 4,588  | 4,611  | 4,631  | 4,649  | 4,665  | 4,679  | 4,692  | 4,703  | 4,713  | 4,723  |
| 24  | 3,955  | 4,126  | 4,239  | 4,322  | 4,386  | 4,437  | 4,480  | 4,516  | 4,546  | 4,573  | 4,596  | 4,616  | 4,634  | 4,651  | 4,665  | 4,678  | 4,690  | 4,700  | 4,710  |
| 25  | 3,942  | 4,112  | 4,224  | 4,307  | 4,371  | 4,423  | 4,466  | 4,502  | 4,532  | 4,559  | 4,582  | 4,603  | 4,621  | 4,638  | 4,652  | 4,665  | 4,677  | 4,688  | 4,698  |
| 26  | 3,930  | 4,099  | 4,211  | 4,294  | 4,358  | 4,410  | 4,452  | 4,489  | 4,520  | 4,546  | 4,570  | 4,591  | 4,609  | 4,626  | 4,640  | 4,654  | 4,666  | 4,677  | 4,687  |
| 27  | 3,918  | 4,087  | 4,199  | 4,282  | 4,346  | 4,397  | 4,440  | 4,477  | 4,508  | 4,535  | 4,558  | 4,579  | 4,598  | 4,615  | 4,630  | 4,643  | 4,655  | 4,667  | 4,677  |
| 28  | 3,908  | 4,076  | 4,188  | 4,270  | 4,334  | 4,386  | 4,429  | 4,465  | 4,497  | 4,524  | 4,548  | 4,569  | 4,587  | 4,604  | 4,619  | 4,633  | 4,646  | 4,657  | 4,667  |
| 29  | 3,898  | 4,065  | 4,177  | 4,260  | 4,324  | 4,376  | 4,419  | 4,455  | 4,486  | 4,514  | 4,538  | 4,559  | 4,578  | 4,595  | 4,610  | 4,624  | 4,637  | 4,648  | 4,659  |
| 30  | 3,889  | 4,056  | 4,168  | 4,250  | 4,314  | 4,366  | 4,409  | 4,445  | 4,477  | 4,504  | 4,528  | 4,550  | 4,569  | 4,586  | 4,601  | 4,615  | 4,628  | 4,640  | 4,650  |
| 35  | 3,852  | 4,017  | 4,128  | 4,210  | 4,273  | 4,325  | 4,369  | 4,406  | 4,437  | 4,465  | 4,490  | 4,511  | 4,531  | 4,549  | 4,565  | 4,579  | 4,593  | 4,605  | 4,616  |
| 40  | 3,825  | 3,988  | 4,098  | 4,180  | 4,243  | 4,295  | 4,339  | 4,376  | 4,408  | 4,436  | 4,461  | 4,483  | 4,503  | 4,521  | 4,537  | 4,552  | 4,566  | 4,579  | 4,591  |
| 60  | 3,762  | 3,922  | 4,030  | 4,111  | 4,174  | 4,226  | 4,270  | 4,307  | 4,340  | 4,368  | 4,394  | 4,417  | 4,437  | 4,456  | 4,474  | 4,489  | 4,504  | 4,518  | 4,530  |
| 80  | 3,732  | 3,890  | 3,997  | 4,077  | 4,140  | 4,192  | 4,236  | 4,273  | 4,306  | 4,335  | 4,360  | 4,384  | 4,405  | 4,424  | 4,442  | 4,458  | 4,473  | 4,487  | 4,500  |
| 120 | 3,702  | 3,858  | 3,964  | 4,044  | 4,107  | 4,158  | 4,202  | 4,239  | 4,272  | 4,301  | 4,327  | 4,351  | 4,372  | 4,392  | 4,410  | 4,426  | 4,442  | 4,456  | 4,469  |
| 240 | 3,672  | 3,827  | 3,932  | 4,011  | 4,073  | 4,125  | 4,168  | 4,206  | 4,239  | 4,268  | 4,294  | 4,318  | 4,339  | 4,359  | 4,378  | 4,394  | 4,410  | 4,425  | 4,439  |
| ∞   | 3,643  | 3,796  | 3,900  | 3,978  | 4,040  | 4,091  | 4,135  | 4,172  | 4,205  | 4,235  | 4,261  | 4,285  | 4,307  | 4,327  | 4,345  | 4,363  | 4,379  | 4,394  | 4,408  |

Fonte: <http://www2.accsnet.ne.jp/miwa/probcalc/duncan/index.html>