(1)(a) $\arccos\left(-\frac{1}{2}\right) = \frac{2\pi}{3} + 2k\pi \quad , k \in \mathbb{Z}$

Falsa.

Justificativa, se é função, só pode ter um valor como resultado, e por definição, $\arccos\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$ pois $\cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$ e $\frac{2\pi}{3} \in [0, \pi]$.

(b) $3{,}14 < \pi < 3{,}15 \Longrightarrow \frac{1}{3{,}14} < \frac{1}{\pi} < \frac{1}{3{,}15}$.

Falso.

Justificativa: $3{,}14 < \pi \Longrightarrow \cancel{3{,}14} \times \frac{1}{\cancel{3{,}14}} \times \frac{1}{\pi} < \cancel{\pi} \times \frac{1}{3{,}14} \times \frac{1}{\cancel{\pi}} \Longrightarrow$

$\Longrightarrow \frac{1}{\pi} < \frac{1}{3{,}14}$.

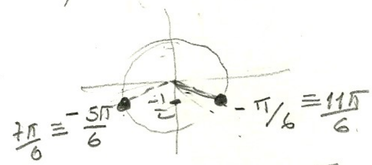
O correto seria: $\frac{1}{3{,}15} < \frac{1}{\pi} < \frac{1}{3{,}14}$.

2)(a) $1 + 2\,\mathrm{sen}\left(\frac{\pi}{4}x\right) = 0 \quad , \quad \theta = \frac{\pi}{4}x$

$1 + 2\,\mathrm{sen}(\theta) = 0$

$2\,\mathrm{sen}(\theta) = -1$

$\mathrm{sen}(\theta) = -\frac{1}{2}$



$2\pi - \frac{5\pi}{6} = \frac{7\pi}{6}$

$2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$

$\theta = \frac{7\pi}{6} + 2k\pi$

$\frac{\pi}{4}x = \frac{7\pi}{6} + 2k\pi$

$x = \frac{4^{2}}{\pi} \cdot \frac{7\pi}{6_{3}} + \frac{4}{\pi} \cdot 2k\pi$

$\boxed{x = \frac{14}{3} + 8k}$

ou

$\theta = \frac{11\pi}{6} + 2k\pi \quad , k \in \mathbb{Z}$

$\frac{\pi}{4}x = \frac{11\pi}{6} + 2k\pi$

$x = \frac{4^{2}}{\pi} \cdot \frac{11\pi}{6_{3}} + \frac{4}{\pi} \cdot 2k\pi$

$\boxed{x = \frac{22}{3} + 8k}$

$k \in \mathbb{Z}$

(b) $\frac{\pi\,\mathrm{sen}(x)}{\mathrm{sen}\,2x} < \frac{2x}{\cos x}$

$\frac{\pi\,\mathrm{sen}\,x}{2\,\mathrm{sen}\,x\cos x} - \frac{2x}{\cos x} < 0$

$\frac{\pi}{2\cos x} - \frac{2x}{\cos x} < 0$

$\frac{\pi - 4x}{2\cos x} < 0$

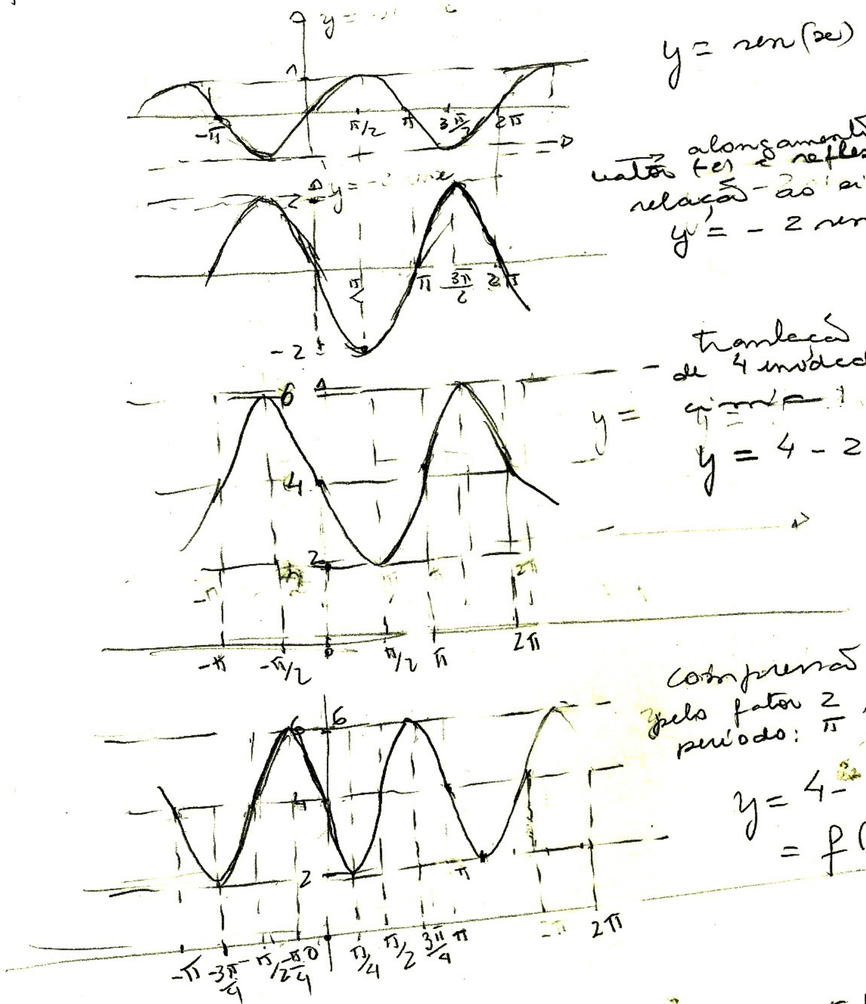
	0		$\pi/4$		$\pi/2$		$3\pi/2$		2π
$\pi - 4x$	+	+	0	−	−	−	−	−	−
$2\cos x$	+	+	+	+	0	−	0	+	+
$\frac{\pi - 4x}{2\cos x}$	+	+	0	−	nd	+	nd	−	−

S_1 S_2

Solução: $S_1 \cup S_2 =$

$= \left(\frac{\pi}{4}, \frac{\pi}{2}\right) \cup \left(\frac{3\pi}{2}, 2\pi\right]$

3) $f(x) = 4 - 2\,\text{sen}(2x)$



$y = \text{sen}(x)$

alongamento em y pelo fator (2) e reflexão em relação ao eixo x:
$y = -2\,\text{sen}(x)$

translação vertical de 4 unidades para cima
$y = 4 - 2\,\text{sen}(x)$

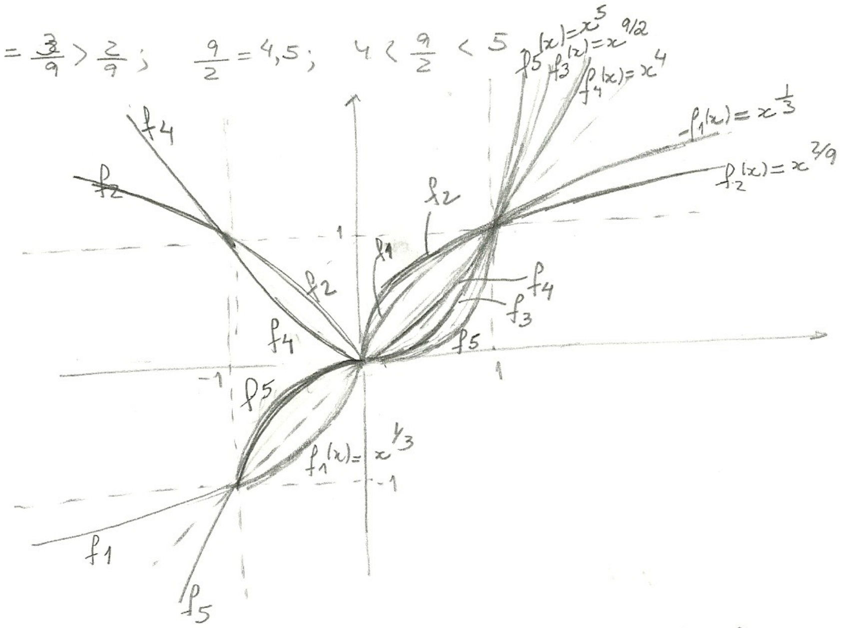
compressão em x, pelo fator 2, novo período: π
$y = 4 - 2\,\text{sen}(2x) = f(x)$

O valor máximo de $f(x)$ é 6, em $x \in [-\pi, \pi]$ são: $x = -\frac{\pi}{4}$ e $x = \frac{3\pi}{4}$

O valor mínimo de $f(x)$ é 2, em $x \in [-\pi, \pi]$ são: $x = -\frac{3\pi}{4}$ e $x = \frac{\pi}{4}$

4) $f_1(x)=x^{1/3}$; $f_2(x)=x^{2/9}$; $f_3(x)=x^{\frac{9}{2}}$; $f_4(x)=x^4$; $f_5(x)=x^5$

(a) $\frac{1}{3}=\frac{3}{9}>\frac{2}{9}$; $\frac{9}{2}=4,5$; $4<\frac{9}{2}<5$



(b) i) $f_2(x)<f_1(x)<f_4(x)<f_3(x)<f_5(x)$ $(x>1)$

ii) $f_5(x)<f_3(x)<f_4(x)<f_1(x)<f_2(x)$ $(0<x<1)$

iii) p/ $x<0$ $\nexists\, f_3(x)=x^{\frac{9}{2}}=\sqrt{x^9}$, logo $f_1(x)<f_5(x)<f_4(x)<f_2(x)$ $(-1<x<0)$

iv) idem, $\nexists\, f_3(x)$ e $f_5(x)<f_1(x)<f_2(x)<f_4(x)$

5) (a) $(5)^{4x}+3(5)^{2x}=10$, $y=5^{2x}$ (nova variável), $(5)^{4x}=y^2$.

$y^2+3y-10=0 \iff y=\frac{-3\pm\sqrt{9+40}}{2} \iff y=\frac{-3\pm 7}{2} \iff y=2$ ou $y=-5$

$y=2 \Rightarrow 5^{2x}=2 \iff \log_5 5^{2x}=\log_5 2 \iff 2x=\log_5 2$

$y=-2 \Rightarrow 5^{2x}=-5$, impossível, $5^{2x}>0,\ \forall x$

$\boxed{x=\frac{1}{2}\log_5 2}$

(b) $\ln\left(\frac{5-4x}{x^2}\right)\leq 0$

Domínio: x; $\frac{5-4x}{x^2}>0$ e $x^2\neq 0$, mas $x^2\geq 0$

logo, $5-4x>0 \iff 5>4x \iff \boxed{x<\frac{5}{4}}$

$\ln\left(\frac{5-4x}{x^2}\right)\leq 0 \iff 0<\frac{5-4x}{x^2}\leq 1 \Rightarrow$

$\cancel{5-}\,5-4x\leq x^2 \Rightarrow x^2+4x-5\geq 0$

$x=\frac{-4\pm\sqrt{36}}{2}$

$x=\begin{cases}\frac{-4+6}{2}=1\\ \frac{-4-6}{2}=-5\end{cases}$

+ 0 − 0 +
−5 1

logo, como $x<\frac{5}{4}$, solução $\boxed{x\leq -5 \text{ ou } 1\leq x<5}$