NOME: FELIPE ANCHIETA DO CUNHO MENDES

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① a) $*\log(x) = 7\left(\frac{x-2}{7}\right) + 2 = x$ //

$*g \circ f(x) = \frac{(7x+2)-2}{7} = x$ //

b) $*\log(x) = 16 - (\sqrt{16-x})^2 = 16 - 16 + x = x$ //

$*g \circ f(x) = \sqrt{16-(16-x^2)} = \sqrt{16+16+x^2}$

$= \sqrt{x^2} = |x| = x$ //

c) $*\log(x) = 7 - (\sqrt[3]{7-x})^3 = 7 - (7-x) = x$ //

$*g \circ f(x) = \sqrt[3]{7-(7+x^3)} = \sqrt[3]{7-7+x^3} = x$ //

②

$f \circ f(x) = \frac{\left(\frac{x+2}{2x-1}\right)+2}{2\left(\frac{x+2}{2x-1}\right)-1} = \frac{\frac{x+2+2(2x-1)}{2x-1}}{\frac{2(x+2)-1}{2x-1}}$

$= \frac{5x}{2x-1-2x+1} = \frac{5x}{\frac{2(x+2)}{2x-1}-1} = \frac{5x}{(2x-1)\left(\frac{(x+2)\cdot 2}{2x-1}-1\right)}$

$$\frac{5x}{(2x-1)\left(\frac{(x+2)2}{2x-1} - \frac{1(2x-1)}{2x-1}\right)} = \frac{5x}{(2x-1)\left(\frac{2x+4-2x+1}{2x-1}\right)}$$

$$= \frac{5x}{(2x-1)\left(\frac{5}{2x-1}\right)} = \frac{5x}{5} = x \;//$$

Logo, $f \circ f(x) = x$.

③ $\begin{cases} f(x) \cdot g(x) = x-1 \\ f(x) = x^2 - 2x + 1 \end{cases}$

$$g(x)(x^2-2x+1) = x-1$$
$$g(x)(x+1)^2 = (x-1)$$

$$g(x) = \frac{(x-1)}{(x+1)^2}, \text{ and } x \neq -1 \;//$$

④

$$f(x) = \begin{cases} 3x+1, & \text{se } x \geq 0 \\ 2x-1, & \text{se } x < 0 \end{cases}$$

$$g(x) = |4x-5| \begin{cases} 4x-5, & \text{se } x \geq 0 \\ -(4x-5), & \text{se } x < 0 \end{cases}$$

a) $(f+g)(x)$

p/ $x < 0$	0	p/ $x \geq 0$
$(f+g)(x) = 2x-1-(4x-5)$		$(f+g)(x) = 3x+1+4x-5$
$= 2x-1-4x+5$		$= 7x-4$
$= -2x+4$		
$= 4-2x$		

$$(f+g)(x) = \begin{cases} 7x-4, & \text{se } x \geq 0 \\ 4-2x, & \text{se } x < 0 \end{cases}$$

$D(f+g)(x) = \mathbb{R}$ //

b) $(f \cdot g)(x)$

p/ $x < 0$	0	p/ $x \geq 0$
$f \cdot g(x) = (2x-1)(-4x+5)$		$f \cdot g(x) = (3x+1)(4x-5)$
$= -8x^2+10x+4x-5$		$= 12x^2-15x+4x-5$
$= -8x^2+14x-5$		$= 12x^2-11x-5$

$$(f \cdot g)(x) = \begin{cases} -8x^2+14x-5, & \text{se } x < 0 \\ 12x^2-11x-5, & \text{se } x \geq 0 \end{cases}$$

$D(f \cdot g)(x) = \mathbb{R}$ //

c) $(f/g)(x)$

p/ $x < 0$	0	p/ $x \geq 0$
$f/g(x) = \frac{2x-1}{-4x+5} = \frac{2x-1}{5-4x}$		$f/g(x) = \frac{3x+1}{4x-5}$
$\text{Dom} = \mathbb{R} - \{5/4\}$		$\text{Dom} = \mathbb{R} - \{5/4\}$

$$\left(\frac{f}{g}\right)(x) = \begin{cases} \frac{2x-1}{5-4x}, & \text{se } x < 0 \\ \frac{3x+1}{4x-5}, & \text{se } x \geq 0 \end{cases}$$

$$\text{Dom}\left(\frac{f}{g}\right)(x) = \mathbb{R} - \{5/4\}$$

(5)

a) $f+g = 2x + x^2 + 1 = x^2 + 2x + 1$

$f-g = 2x - x^2 - 1 = -x^2 + 2x - 1$

$f \cdot g = 2x(x^2+1) = 2x^3 + 2x$

$\frac{f}{g} = \frac{2x}{x^2+1}$

$f \circ g = 2(x^2+1) = 2x^2 + 2$

$g \circ f = (2x)^2 + 1 = 4x^2 + 1$

b) $|x| = \begin{cases} -x, & \text{se } x < 0 \\ x, & \text{se } x \geq 0 \end{cases}$

$f+g$:

se $x < 0$	0	se $x \geq 0$
$= 3x - 2 - x$		$= 3x - 2 + x$
$= 2x - 2$		$= 4x - 2$
$= 2(x-1)$		$= 2(2x-1)$

$$f+g = \begin{cases} 2(x-1), & \text{se } x < 0 \\ 2(2x-1), & \text{se } x \geq 0 \end{cases}$$

* $f-g$:

p/ $x<0$	0	p/ $x\geq 0$
$=3x-2-(-x)$		$=3x-2-x$
$=3x-2+x$		$=2x-2$
$=4x-2$		$=2(x-1)$
$=2(2x-1)$		

$$f-g=\begin{cases}2(2x-1), & \text{se } x<0\\ 2(x-1), & \text{se } x\geq 0\end{cases}$$

* $f\cdot g$:

p/ $x<0$	0	p/ $x\geq 0$
$=(3x-2)(-x)$		$=(3x-2)(x)$
$=-3x^2+2x$		$=3x^2-2x$
$=x(2-3x)$		$=x(3x-2)$

$$f\cdot g=\begin{cases}-3x^2+2x, & \text{se } x<0\\ 3x^2-2x, & \text{se } x\geq 0\end{cases}$$

* f/g:

p/ $x<0$	0	p/ $x>0$
$=\frac{3x-2}{-x}$		$=\frac{3x-2}{x}$
$=\frac{-(3x-2)}{x}$		
$=\frac{-3x+2}{x}$	$x\neq 0$	

$$f/g(x)=\begin{cases}\frac{-3x+2}{x}, & \text{se } x<0\\ \frac{3x-2}{x}, & \text{se } x>0\end{cases} \qquad D=\mathbb{R}-\{0\}$$

* $log(x)$:

p/ $x<0$	0	p/ $x\geq 0$
$= 3\|x\| - 2$		$= 3\|x\| - 2$
$= 3(-x) - 2$		$= 3x - 2$
$= -3x - 2$		

$$log = \begin{cases} -3x-2, & \text{se } x<0 \\ 3x-2, & \text{se } x\geq 0 \end{cases}$$

* $gof(x)$:

p/ $x<0$	0	p/ $x\geq 0$
$= -(3x-2)$		$= 3x-2$
$= -3x+2$		$= 3x-2$

$$gof(x) = \begin{cases} -3x+2, & \text{se } x<0 \\ 3x-2, & \text{se } x\geq 0 \end{cases}$$