Calc I - Hw # 1 Solutions

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p. 14 4c $|4+\frac{t}{2}| = |\frac{3}{2}t-2|$ *note: $\therefore$ = therefore

$\therefore \pm(4+\frac{t}{2}) = \pm(\frac{3}{2}t-2)$

$\therefore 4+\frac{t}{2} = \frac{3}{2}t-2$ and $4+\frac{t}{2} = -(\frac{3}{2}t-2)$

$6 = \frac{3}{2}t - \frac{1}{2}t$ $\quad 4+\frac{t}{2} = -\frac{3t}{2}+2$

$6 = (\frac{3}{2}-\frac{1}{2})t$ $\quad 2 = -\frac{3}{2}t - \frac{t}{2}$

$\boxed{6 = t}$ $\quad 2 = (-\frac{3}{2} + -\frac{1}{2})t$

$2 = -\frac{4}{2}t = -2t$

$\boxed{t=-1}$

6b $|3-4x| \geq 2$

$3-4x \geq 2$ or $3-4x \leq -2$

$-4x \geq -1$ $\quad -4x \leq -5$

$x \leq \frac{1}{4}$ $\quad x \geq \frac{5}{4}$

$\boxed{(-\infty, \frac{1}{4}] \cup [\frac{5}{4}, \infty)}$

29. The line passing through (0,1) and (3,0) has slope $m = \frac{y_2-y_1}{x_2-x_1} = \frac{-1}{3}$

Since parallel lines have the same slope, our line has slope $-\frac{1}{3}$

Now use point-slope formula:

$y-y_0 = m(x-x_0)$

$y-(-1) = -\frac{1}{3}(x-(-1))$

$y+1 = -\frac{1}{3}(x+1)$

$\boxed{y = -\frac{1}{3}x - \frac{4}{3}}$

42. The vertical line passing through (1,4) is $x=1$ with undefined slope. A line perpendicular has slope = 0, or a horizontal line. Since it passes through (-2,5), the equation is

$\boxed{y=5}$

Hw solns

p. 43 16. $f(x) = \frac{1}{x+1} \quad (x \neq -1) \qquad g(x) = 2x^2$

a) $(f \circ g)(x) = f(g(x)) = f(2x^2) = \frac{1}{2x^2+1}$

Domain: $\mathbb{R}$

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

Domain: $x \neq -1$

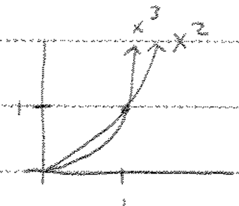
20. let $f = x^4$, $x \geq 0$

let $g(x) = \sqrt[4]{x}$

$f \circ g = f(g(x)) = (\sqrt[4]{x})^4 = x$

$g \circ f = g(f(x)) = \sqrt[4]{x^4} = x$

25. a) $f(x) = x^2 \qquad g(x) = x^3$ for $x \geq 0$



b) let $0 \leq x \leq 1$

mult by x^2: $\quad 0 \leq x^3 \leq x^2 \quad$ since $x^2 > 0$, doesn't change direction of inequality

c) let $x \geq 1$

mult by x^2: $\quad x^3 \geq x^2$

34. $f(x) = \frac{2x}{(x-2)(x+3)}$

Domain: $x \neq 2, -3$ or $(-\infty, -3) \cup (-3, +2) \cup (2, +\infty)$

Range: $\mathbb{R}$

70 a) $f(x) = x^3 - 1 \quad x \in \mathbb{R}$

show $f(x)$ is one-to-one: since $f(x)$ is increasing, it is one-to-one

(passes horizontal line test)

inverse: $y = x^3 - 1$

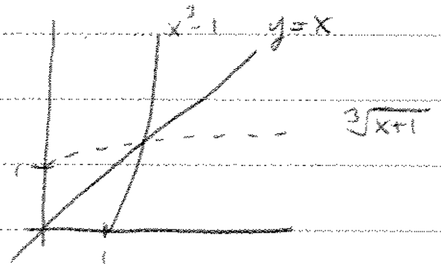
① switch x & y: $x = y^3 - 1$

② solve for y: $y = \sqrt[3]{x+1}$

③ replace y with $f^{-1}(x)$: $f^{-1}(x) = \sqrt[3]{x+1}$

domain: $\mathbb{R}$

b)



80 $f(x) = \left(\frac{1}{2}\right)^x \quad x \geq 0$

inverse of $y = \left(\frac{1}{2}\right)^x$

① switch: $x = \left(\frac{1}{2}\right)^y$

② solve for y: (use log's!) $\ln x = \ln\left(\frac{1}{2}\right)^y$

$= y \ln\left(\frac{1}{2}\right)$

$= y(\ln 1 - \ln 2)$

$= -y \ln 2 \qquad * \ln 1 = 0$

$\therefore y = \frac{-\ln x}{\ln 2}$

③ replace y w/ $f^{-1}(x)$:

$f^{-1}(x) = \frac{-\ln x}{\ln 2}$ Domain: Positive reals, $(0, \infty)$, $\mathbb{R}^+$