

Any WebAssign Questions?

Put the Section and Number in the Chat and we'll look at 'em.

WebAssign: Summative Assessment

Hand-Graded Work: Formative Assessment

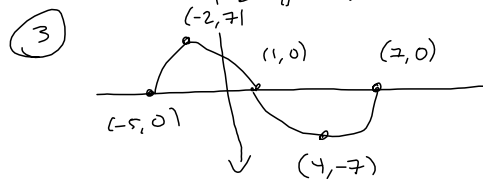
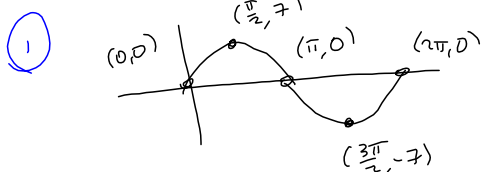
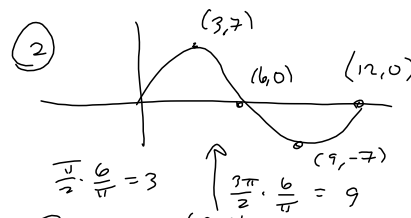
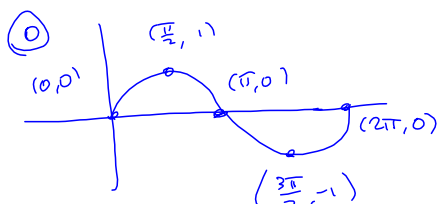
Most of you haven't done much of the homework, yet. Some are doing a handful of exercises and moving on to the next section.

$$f(x) = 7 \sin\left(\frac{\pi}{6}x + \frac{5\pi}{6}\right) + 11$$

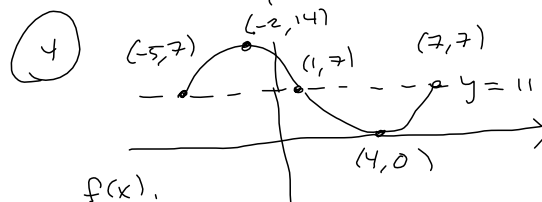
$$g(x) = 5 \sin(x)$$

$$\frac{\pi}{6}x + \frac{5\pi}{6} = \frac{\pi}{6}(x+5)$$

- 1  $7 \sin(x)$   $y \mapsto 7y$  vertical stretch
- 2  $7 \sin\left(\frac{\pi}{6}x\right)$   $x \mapsto \frac{\pi}{6}x$  horizontal stretch  $f(5x)$  shrink
- 3  $7 \sin\left(\frac{\pi}{6}(x+5)\right)$   $x \mapsto x-5$  left 5  $f\left(\frac{1}{5}x\right)$  stretch
- 4  $7 \sin\left(\frac{\pi}{6}(x+5)\right) + 11$   $y \mapsto y+11$  up 11



2



Some resources for building graphs of families of functions:

<https://harryzaims.com/121-all/videos/03-Writing-Projects/Writing-Project-2/Fall-2016-example/>

New functions from old  
 sum  $f+g$ , difference  $f-g$ , product  $fg$ , quotient  $\frac{f}{g}$ , composition  $f \circ g$

$$f(x) = \sqrt{x+2}, \quad g(x) = \frac{1}{x}$$

$$\mathcal{D}(f) = [2, \infty), \quad \mathcal{D}(g) = (-\infty, 0) \cup (0, \infty) = \mathbb{R} \setminus \{0\}$$

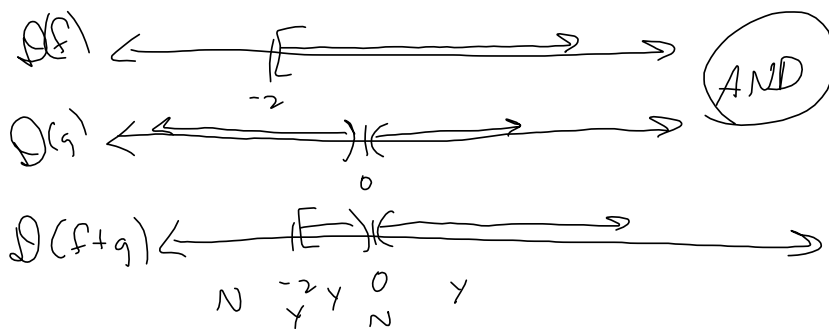
Need  $x+2 \geq 0$   
 $x \geq -2$

Need  $x \neq 0$



$$D(f+g) = D(f) \overset{\text{AND}}{\cap} D(g)$$

$$= \{x \mid x \in D(f) \text{ and } x \in D(g)\}$$



$$= (-2, 0) \cup (0, \infty) = D(f+g)$$

SAME thing for  $D(fg)$

$$D\left(\frac{f}{g}\right) = D(f) \cap D(g) \cap \{x \mid g(x) \neq 0\}$$

$g(x) = \frac{1}{x} \stackrel{\text{SET}}{=} 0 \Rightarrow 1=0 \rightarrow$  Never happens, so  
is no restriction.

$$D\left(\frac{g}{f}\right) = D(f) \cap D(g) \cap \{x \mid f(x) \neq 0\}$$

$$f(x) = \sqrt{x+2} \stackrel{\text{SET}}{=} 0 \Rightarrow$$

$$x+2 = 0 \Rightarrow x = -2$$

$$\frac{g}{f} = \frac{g(x)}{f(x)} = \frac{\frac{1}{x}}{\sqrt{x+2}} = \frac{1}{x\sqrt{x+2}}$$

Need  $x\sqrt{x+2} \neq 0$

and  $x+2 \geq 0$

Logic/Sets

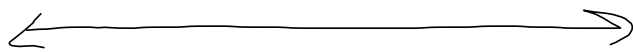
$$\text{NOT } (A \text{ OR } B) =$$

NOT A and NOT B

$$x\sqrt{x+2} \neq 0 \Rightarrow$$

$$x \neq 0 \text{ AND } x \neq -2$$

Need  $x \geq -2$



$$D\left(\frac{g}{f}\right) = (-2, 0) \cup (0, \infty)$$

$$\text{NOT } (A \text{ and } B) =$$

NOT A OR NOT B

$D(f \circ g)$  The output of  $g(x)$  is fed to

$$f \circ g = (f \circ g)(x) = f(g(x))$$

$$f(x) = \sqrt{x+2}, \quad g(x) = \frac{1}{x}$$

$$f(g(x)) = \sqrt{g(x)+2}$$

$$D(f \circ g) = \left\{ x \mid x \in D(g) \text{ and } g(x) \in D(f) \right\}$$

$$D(g) = \mathbb{R} \setminus \{0\}$$

$g(x) \in D(f)$  means  
 $g(x) \in [-2, \infty)$  means

$$\frac{1}{x} \geq -2$$

To solve  $\frac{1}{x} \geq -2$ , Do NOT  
 clear fractions. Why not?

$$\Rightarrow \text{(i)} \quad 1 \geq -2x \text{ if } x > 0$$

$$\text{(ii)} \quad 1 \leq -2x \text{ if } x < 0$$

$$\frac{1}{x} + 2 \geq 0$$

LCD = x  $\rightarrow$

$$\frac{1}{x} + 2\left(\frac{x}{x}\right) \geq 0$$

$$\frac{1+2x}{x} \geq 0$$

$1+2x=0$   
 $2x=-1$   
 $x=-\frac{1}{2}$

$$(-\infty, -\frac{1}{2}] \cup (0, \infty)$$

$$D(g) = \mathbb{R} \setminus \{0\}$$

$$D(f \circ g) = (-\infty, -\frac{1}{2}] \cup (0, \infty)$$

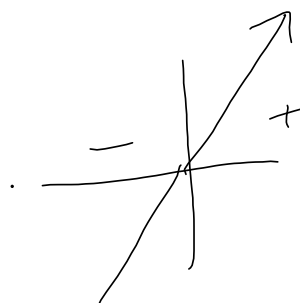
$$-3x > 21$$

$$\frac{-3x}{-3} < \frac{21}{-3}$$

$$x < \frac{21}{-3} = -7$$

multiplication/division by a  
 negative reverses the sense  
 of the inequality.

Carlos Alexander,



$$f(x) = \frac{2x+4}{x-1}, \quad g(x) = \sqrt{x-7}$$

$\mathcal{D}(g \circ f)$

$$(g \circ f)(x) = g(f(x)) = \sqrt{f(x)-7} = \sqrt{\frac{2x+4}{x-1} - 7}$$

$$g(\Delta) = \sqrt{\Delta-7}$$

$$g(\text{smiley}) = \sqrt{\text{smiley}-7}$$

Formal:

$$\{x \mid x \in \mathcal{D}(f) \text{ and } f(x) \in \mathcal{D}(g)\}$$

Practical:

$$\text{Need } \frac{2x+4}{x-1} - 7 \geq 0$$

$$\Rightarrow \frac{2x+4}{x-1} - 7 \left( \frac{x-1}{x-1} \right) \geq 0$$

$$\Rightarrow \frac{2x+4-7x-7}{x-1} = \frac{-5x-3}{x-1} \geq 0$$

Horizontal Asymptote

H.A.

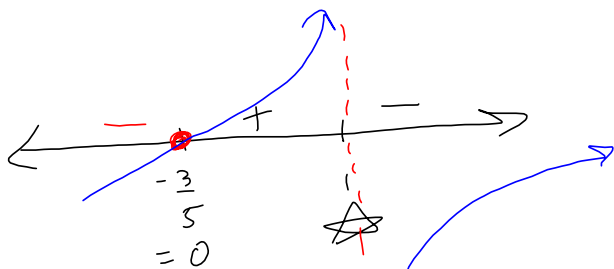
$$-\frac{5x}{x} = -5 = y = \text{H.A.}$$

$$x = 1$$

$$-5x - 3 = 0$$

$$-5x = 3$$

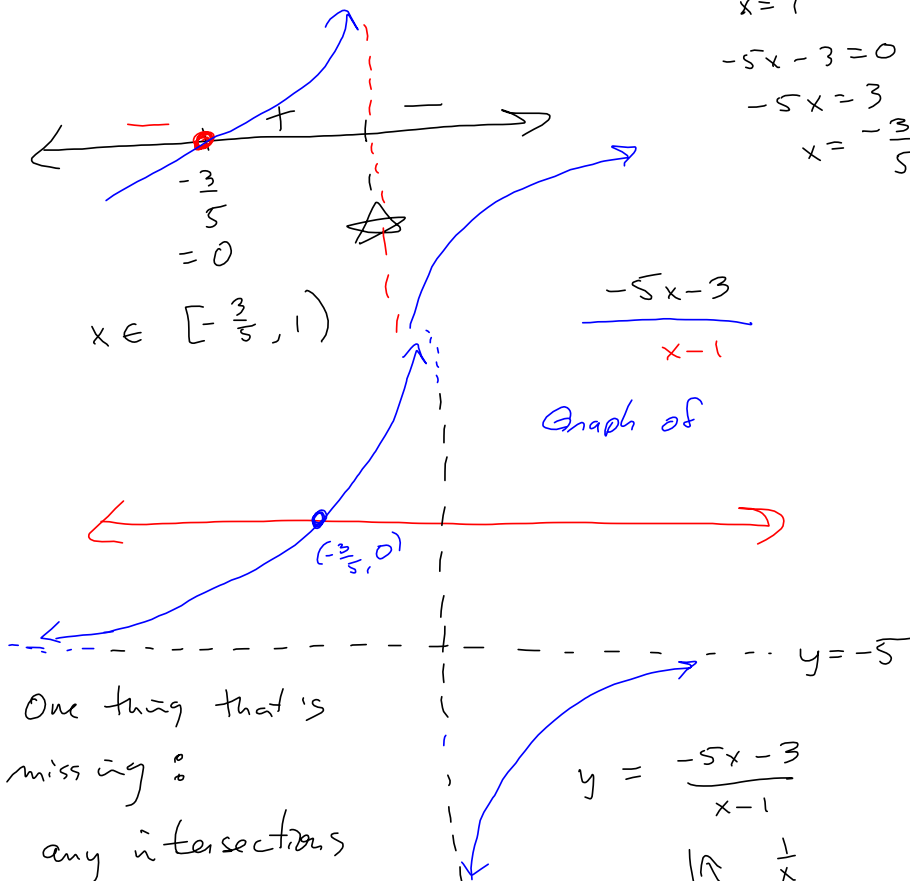
$$x = -\frac{3}{5}$$



$$x \in \left[-\frac{3}{5}, 1\right)$$

$$\frac{-5x-3}{x-1}$$

Graph of



One thing that's missing:

any intersections with  $y = -5$

$$y = \frac{-5x-3}{x-1}$$



More on this is in § 3.5 from College Algebra.

I recommend it!

Test-Prep Videos, Old Tests.

College Algebra