Test 1 Add 15 pts

$(7x)(7x) = 49x^2$

$(7i)(7i) =$

$49i^2 = -49$

Write in the form $a+bi$

$i = \sqrt{-1}$

$i^2 = -1$

$(4-7i)(4+7i) = 16 + 28i - 28i - (7i)(7i)$

$= 16 - (-49) = 16 + 49$

$\left(\frac{3+2i}{4-7i}\right)\left(\frac{4+7i}{4+7i}\right) = \frac{(3+2i)(4+7i)}{(4-7i)(4+7i)} = \frac{12+21i+8i-14}{4^2+7^2}$

$= \frac{12+29i-14}{65} = \frac{-2+29i}{65} = \frac{-2}{65} + \frac{29}{65}i$

Feb 7-8:52 AM

§2.4

$f(x) + g(x) = (f+g)(x)$ sum

$f(x) - g(x) = (f-g)(x)$ difference

$f(x)g(x) = (fg)(x)$ product

$\frac{f(x)}{g(x)} = \left(\frac{f}{g}\right)(x)$ difference.

Domain: $\{x \mid f(x) \text{ is real}\} = \mathcal{D}(f)$

1. $\frac{\text{STUFF}}{0}$ BAD

2. $\sqrt{\text{Negative}}$ BAD

$\frac{1}{\sqrt{13-x}}$

$\mathcal{D} = (-\infty, 13)$

Find domain:

$f(x) = \frac{1}{\sqrt{13-x}}$

1. $\frac{\text{STUFF}}{0}$ can't let

$\sqrt{13-x} = 0 \Rightarrow 13 - x = 0$

$\Rightarrow 13 = x$

$\boxed{x \neq 13}$

2. Need $13 - x \geq 0$

$\boxed{13 \geq x}$

AND

So, $x < 13$

This is a nice combo.

$$\underbrace{13 - x \geq 0 \quad \& \quad 13 - x \neq 0}_{13 - x > 0}$$

$x^2+4x+40=0$

$x^2+4x=-40$

$x^2+4x+2^2=-40+4$

$(x+2)^2=-36$

$x+2=\pm\sqrt{-36}=\pm i\sqrt{36}=\pm i\cdot 6=\pm 6i$

$x+2=\pm 6i$

$x=-2\pm 6i$

Feb 7-9:15 AM

$(x-8)^2 = 64$

$x-8 = \pm\sqrt{64}$

$x-8 = \pm 8$

$x = 8 \pm 8$ → 16, 0

$x \in \{0, 16\}$

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

$\pm$

2.4 Domains

$$\mathcal{D}(f+g) = \mathcal{D}(f-g) = \mathcal{D}(fg)$$

$$= \mathcal{D}(f) \underset{\text{AND}}{\cap} \mathcal{D}(g) = \{x \mid x \in \mathcal{D}(f) \text{ and } x \in \mathcal{D}(g)\}$$

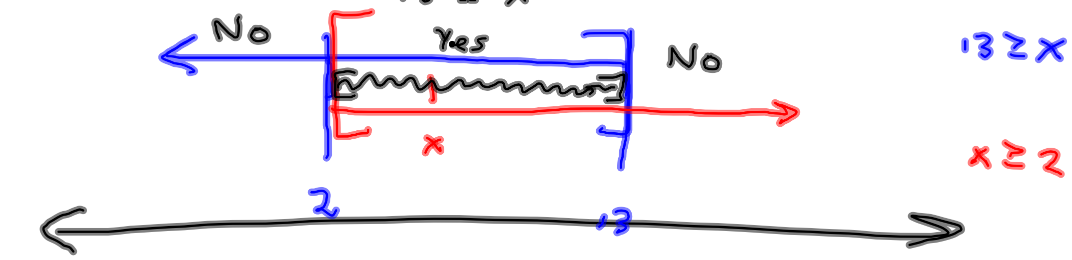
$f(x) = \sqrt{6x-12}$ $\qquad$ $\mathcal{D}(f)$: Need $6x-12 \geq 0$

$g(x) = \sqrt{13-x}$ $\qquad\qquad\qquad\qquad$ $6x \geq 12$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ $x \geq 2$

$\mathcal{D}(g)$ Need $\quad 13 - x \geq 0$

$\qquad\qquad\qquad\quad 13 \geq x$



$[2, 13]$

$$(f+g)(x) = f(x) + g(x) = \sqrt{6x-12} + \sqrt{13-x}$$

$$(fg) = \left(\sqrt{6x-12}\right)\left(\sqrt{13-x}\right) \quad \text{STOP!}$$

$\mathcal{D}(\frac{f}{g})$ = Same as $\mathcal{D}(fg)$ & $\mathcal{D}(f+g)$, AND
can't let $g(x)=0$.

$\mathcal{D}(fg) = [2, 13]$

Now throw out any x's that make
$g(x)=0$

$\sqrt{13-x} = 0$

$13 - x = 0$

$13 = x$ is bad.

So $\mathcal{D}(\frac{f}{g}) = [2, 13)$

Throw out $x=13$. It makes $g(x)=0$.

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

$$f(x) = x^2$$

$$f(\boxed{\qquad}) = \boxed{\qquad}^2$$

$$f(g(x)) = (g(x))^2$$

$$f(g(☺)) = (g(☺))^2$$

$f(x) = |x|$, $g(x) = x - 8$, $h(x) = x^3$

$$(f \circ g)(x) = f(g(x)) = f(x-8) = |x-8|$$

$$(g \circ f)(x) = g(f(x)) = g(|x|) = |x| - 8$$

Inside-out

$$(f \circ h \circ g)(x) = f(g(h(x))) = f(g(x^3))$$

$$= f(x^3 - 8) = |x^3 - 8|$$

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

Need $x \in \mathcal{D}(g)$ $\qquad$ g chews on it first.

AND

Need $g(x) \in \mathcal{D}(f)$ $\qquad$ f chews on the output from g.

$g(x) = \sqrt{2x+6}$

$f(x) = \frac{1}{x-2}$

Find $(f \circ g)(x)$ & its domain.

$f(\boxed{g(x)}) = \frac{1}{\boxed{g(x)} - 2}$

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

$= \frac{1}{\sqrt{2x+6} - 2}$

$\mathcal{D}$: Need $x \in \mathcal{D}(g)$ AND $g(x) \in \mathcal{D}(f)$

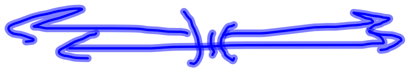
$\mathcal{D}(g)$: Need $2x + 6 \geq 0$

$2x \geq -6$

$x \geq -3$

Now for $g(x) \in \mathcal{D}(f)$:

$\mathcal{D}(f) = \{x \mid x \neq 2\}$



$= (-\infty, 2) \cup (2, \infty) = \mathcal{D}(f)$

Now, we need

$= \{x \mid g(x) \neq 2\}$

Need $\sqrt{2x+6} - 2 \neq 0$

$\sqrt{2x+6} \neq 2$

$2x+6 \neq 2^2 = 4$

$2x+6 \neq 4$

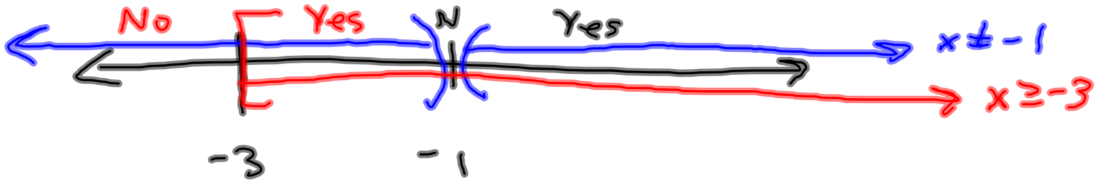
$2x \neq -2$

$x \neq -1$

$f(x) = \dfrac{1}{x-2}$

$f(g(x)) = \dfrac{1}{\sqrt{2x+6} - 2}$

Combine: $\{x \mid x \geq -3 \text{ AND } x \neq -1\}$



$[-3, -1) \cup (-1, \infty) = \mathcal{D}(f \circ g)$

SI @ 3pm
EDBH 140.