Tues
LD136 @ 8am - 10am 5/5

30 questions
15 old stuff 15 (after Exam 3) stuff
↳ 5 from each exam
↳ Question structure is same but #s are different

Exam 1 Review

3d Domains of composition functions

- Find the domain of the inner function
- Find the domain of the composition.

$f(x) = 3x-2$ and $g(x) = \frac{1}{x+1}$

$(f \circ g)(x)$

- Domain of inner $[g(x)]$
  $x \neq -1$
- Domain of composition $[f \circ g]$

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

$= 3\left(\frac{1}{x+1}\right) - 2$

$= \frac{3}{x+1} - 2$

$$= \frac{3}{x+1} - 2$$

$x \neq -1$

Answer: $x \neq -1 \Rightarrow (-\infty, -1) \cup (-1, \infty)$

5a) Simplify

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

$$= \frac{1}{2x} \cdot \frac{2x+1}{2x+2}$$

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

5f) Rationalize the denominator

$$\frac{2}{\sqrt{x} - \sqrt{5}} \cdot \frac{\sqrt{x} + \sqrt{5}}{\sqrt{x} + \sqrt{5}}$$

$$(a-b)(a+b) = a^2 - b^2$$

$$= \frac{2(\sqrt{x} + \sqrt{5})}{(\sqrt{x})^2 - (\sqrt{5})^2}$$

$$= \frac{2(\sqrt{x} + \sqrt{5})}{x-5}$$

6d) $a^2 - b^2 = (a-b)(a+b)$

$$81x^2 - 25y^2 = (9x)^2 - (5y)^2$$

$$= (9x - 5y)(9x + 5y)$$

7 Domains: $\frac{1}{?} \Rightarrow ? \neq 0$

$\sqrt{?} \Rightarrow ? \geq 0$

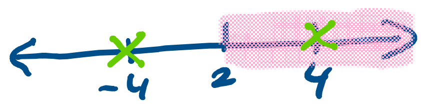
$\frac{1}{\sqrt{?}} \Rightarrow ? > 0$

a $\sqrt{?} \Rightarrow \sqrt{x-2} \Rightarrow x-2 \geq 0$

$x \geq 2$

$\frac{1}{?} \Rightarrow x^2-16 \neq 0$

$x \neq \pm 4$



Answer: $[2,4) \cup (4,\infty)$

Exam 2 Review

2a $(4,-3) \rightarrow (4-5,-3)$

$(-1,-3)$

$y = f(\underbrace{x+5}_{\text{Left } 5})$

2b $(-2,6) \longrightarrow (-2, 6+4)$

$(-2,10)$

$y = \underbrace{f(x)+4}_{\text{Up by } 4}$

2c $(3,-2) \rightarrow (3, -2\cdot 3)$

$y = 3\cdot f(x)$

$(3,-6)$

2d $y = f(-x)$

$(8,-1) \rightarrow (-8,-1)$

$(8,-1) \rightarrow (-8,-1)$

③ Discriminant

$b^2-4ac > 0 \Rightarrow$ 2 real sol

$b^2-4ac = 0 \Rightarrow$ 1 real sol

$b^2-4ac < 0 \Rightarrow$ no real sol

(a) $f(x) = \underset{a}{1}x^2 \underset{b}{-5}x \underset{c}{+6}$

$b^2-4ac = (-5)^2 - 4(1)(6)$

$= 25 - 24 = 1 > 0$

$\Rightarrow$ 2 real sol.

④ $a^2 \pm 2ab + b^2 = (a \pm b)^2$

$x^2 - 12x + 36$

$= x^2 - 2 \cdot 6x + 6^2 = (x-6)^2 = 0$

$x = 6$

⑤ $f(x) = a(x-h)^2 + k \rightarrow$ complete the square

$f(x) = \underbrace{2x^2 + 8x}_{\text{Factor the coefficent of } x^2 \text{ term}} + 6$

$= 2(x^2 + 4x + \_) + 6$

$\div 2 \rightarrow (\ )^2$

$= 2(x^2 + 4x + 4 - 4) + 6$

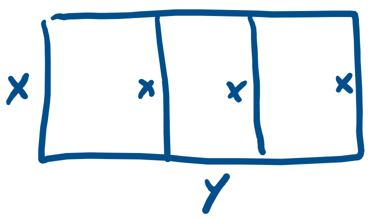
$= 2(x^2 + 4x + 4) + 2(-4) + 6$

$= 2(x+2)^2 - 8 + 6$

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

$$= 2(x+2)^2 - 8 + 6$$
$$= 2(x+2)^2 - 2$$

⑥ $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ Vertex.



$$A = x \cdot y$$
$$640 = P = 2y + 4x$$
$$320 = y + 2x$$
$$y = 320 - 2x$$

$$A = x(320 - 2x)$$
$$= -2x^2 + 320x$$

Max or Min w/ Vertex

$$-\frac{b}{2a} = \frac{-(320)}{2(-2)} = \frac{320}{4} = 80$$

$$A(80) = -2(80)^2 + 320(80)$$
$$= 12800$$

If it asked for dimensions for the max area then plug 80 into

$$y = 320 - 2x$$
$$= 160$$

⑧ Synthetic

ⓐ $x-2$ is a factor.

$\Downarrow$

$x = 2$

$$\begin{array}{r|rrrr} 2 & 1 & -3 & -4 & 12 \\ & \downarrow & 2 & -2 & -12 \\ \hline \end{array}$$

$$
\begin{array}{r|rrrr}
 & \downarrow & 2 & -2 & -12 \\
\hline
 & 1 & -1 & -6 & \boxed{0}
\end{array}
$$

$$x^3 - 3x^2 - 4x - 12 = (x-2)(x^2 - x - 6)$$

$$= (x-2)(x-3)(x+2) = 0$$

$$x = 2, 3, -2$$