

Name: _____

Date: _____

PCH

Ms. Loughran

Please work on odds from both Do Nows

For each function h given below, decompose h into the composition of two functions f and g so that $h = g \circ f$.

$$1. \quad h(x) = \frac{x+2}{\underbrace{x^2+4x+5}_{(x+2)^2+1}}$$

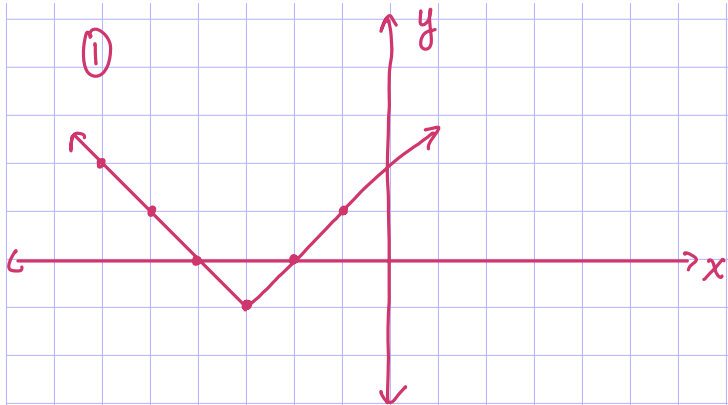
$$2. \quad h(x) = \frac{3x+1}{9x^2+6x+3}$$

$$f(x) = x+2$$

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

Do Now:

Use the algebraic definition of absolute value to rewrite each expression and then sketch the graph on a separate piece of graph paper and find its domain and range.



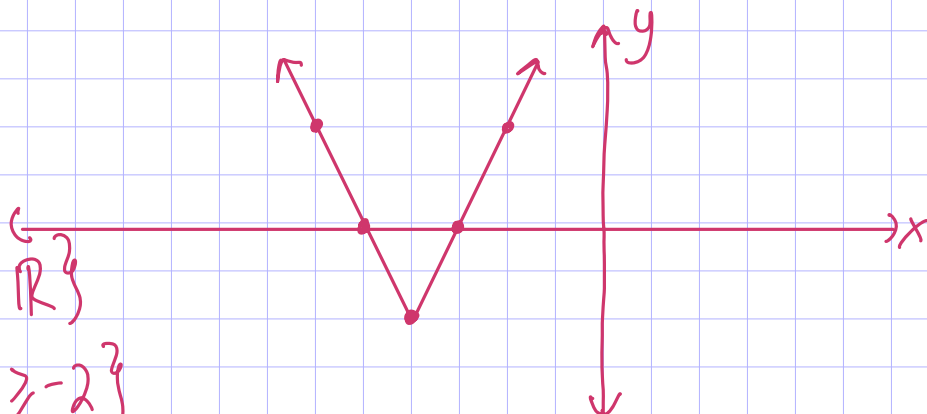
$$D: (-\infty, \infty)$$
$$R: [-1, \infty)$$

1. $f(x) = |x+3| - 1$

$$f(x) = \begin{cases} x+3-1 = x+2 & \text{if } x+3 \geq 0, x \geq -3 \\ -x-3-1 = -x-4 & \text{if } x < -3 \end{cases}$$

3. $f(x) = 2|x+4| - 2$

$$f(x) = \begin{cases} 2(x+4) - 2 = 2x + 6 & \text{if } x+4 \geq 0, x \geq -4 \\ 2(-x-4) - 2 = -2x - 10 & \text{if } x < -4 \end{cases}$$



$$D: \{x \mid x \in \mathbb{R}\}$$

$$R: \{y \mid y \geq -2\}$$

$$* \sin^2 x = (\sin x)^2 \neq \sin x^2$$

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

15. Express each of the following below as composites of two or more of the following:

$$a(x) = x+1 \quad g(x) = x^3 \quad b(x) = x-2 \quad h(x) = \frac{1}{x}$$

$$e(x) = 3x \quad k(x) = \sqrt{x} \quad f(x) = x^2 \quad m(x) = \sin x$$

(a) $3x+1$

(h) $x+2$

(o) $3\sin(x)$

(v) $\frac{1}{\sin^3 x} - 1$

aoe or a(e(x))

(b) $3x+3$
 $3(x+1)$

(i) $x-1$

(p) $\sin(x^2)$

(w) $\frac{1}{3}x$

$e \circ a$

(c) $3x^2$

(j) $x^2 - 1$

(q) $\frac{1}{\sqrt{x}}$

(x) $3\sin^2(3x)$

$e \circ f$

(d) $9x^2$

(k) $3x+2$

(r) $\frac{1}{\sqrt{x-2}}$

(y) $x^2 + 2x + 1$

$f \circ e$

(e) $(x^3 - 2)^2$

(l) $\sqrt{x^3 + 1}$

(s) $\frac{1}{\sqrt{x-2}}$

(z) $x^2 - 2x + 1$

$f(b(g(x)))$

(f) $9x+3$

(m) $\sqrt{x+1}$

(t) $x^{\frac{3}{2}} = \sqrt{x^3}$

(aa) $\frac{1}{\sin^2 x}$

*$3(3x+1)$
 $e \circ a \circ e$*

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

(n) $\sqrt{x+1}$

(u) $\sin^2(3x)$

(bb) $\frac{1}{\sin \sqrt{x}} - 2$

Homework 10-25

Name: _____
PCH: Decomposition Practice

Date: _____
Ms. Loughran

1. If $g(x) = -9x + 3$, find $f(x)$ so that $(g \circ f)(x) = -9x^4 + 3$.

$$\begin{aligned} -9f(x) + 3 &= -9x^4 + 3 \\ -9f(x) &= -9x^4 \\ f(x) &= x^4 \end{aligned}$$

2. If $g(x) = 3x$, find $f(x)$ so that $(g \circ f)(x) = 3x^2 + 3$.

$$\begin{aligned} 3 \cdot f(x) &= 3x^2 + 3 \\ f(x) &= x^2 + 1 \end{aligned}$$

3. If $f(x) = x^2 + 1$, find $g(x)$ so that $(f \circ g)(x) = 4x^2 - 4x + 2$.

$$\begin{aligned} (g(x))^2 + 1 &= 4x^2 - 4x + 2 \\ g(x)^2 &= 4x^2 - 4x + 1 \\ g(x) &= 2x - 1 \end{aligned}$$

4. If $f(x) = -3x + 7$, find $g(x)$ so that $(f \circ g)(x) = -6x^2 + 31$.

$$\begin{aligned} -3 \cdot g(x) + 7 &= -6x^2 + 31 \\ -3g(x) &= -6x^2 + 24 \\ g(x) &= 2x^2 - 8 \end{aligned}$$

5. If $f(x) = 2x - 5$, find $g(x)$ so that $(f \circ g)(x) = 2x - 1$.

$$2g(x) - 5 = 2x - 1$$

$$2g(x) = 2x + 4$$

$$g(x) = x + 2$$

6. If $f(x) = x^2 + 7$, find $g(x)$ so that $(f \circ g)(x) = x^2 - 6x + 16$.

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

$$g^2(x) + 7 = x^2 - 6x + 16$$

$$g^2(x) = x^2 - 6x + 9$$

$$g(x) = (x - 3)^2$$

$$g(x) = x - 3$$

7. If $f(x) = x^2$, find $g(x)$ so that $(f \circ g)(x) = 16x^2 - 24x + 9$.

$$g^2(x) = 16x^2 - 24x + 9$$

$$g(x) = (4x - 3)^2$$

$$g(x) = 4x - 3$$

8. If $f(x) = \sqrt{x - 8}$, find $g(x)$ so that $(f \circ g)(x) = \sqrt{-4x - 6}$.

$$\sqrt{g(x) - 8} = \sqrt{-4x - 6}$$

$$g(x) - 8 = -4x - 6$$

$$g(x) = -4x + 2$$