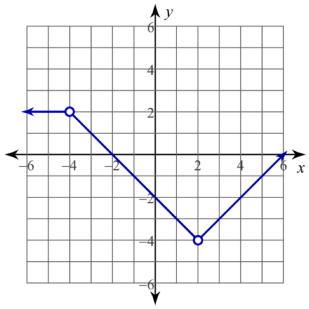
Do Now

① Write a rule for the function shown.



$$f(x)=\begin{cases} 2 & x<-4 \\ -x-2 & -4<x<2 \\ x-6 & x>2 \end{cases}$$

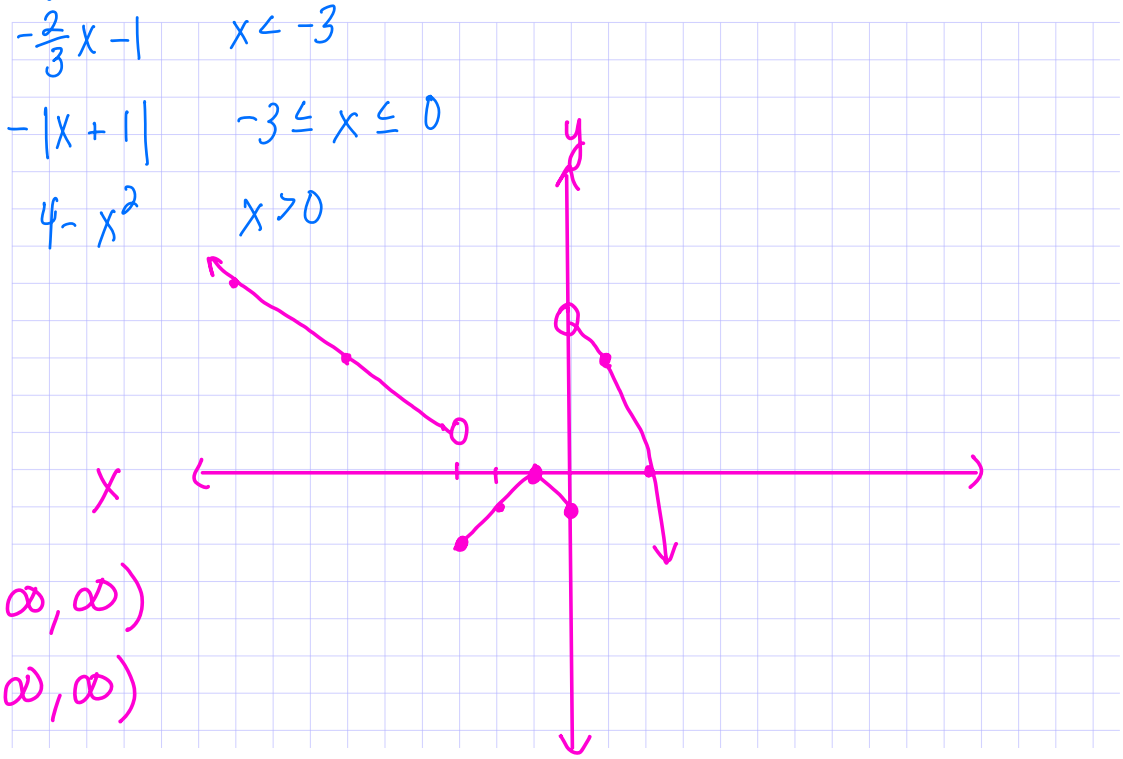
$\{x|x\in\mathbb{R}/-4,2\}$

$D:(-\infty,-4)\cup(-4,2)\cup(2,\infty)$

$R:(-4,\infty)$

② Graph the piecewise function and state its domain and range:

$$f(x)=\begin{cases} -\frac{2}{3}x-1 & x<-3 \\ -|x+1| & -3\le x\le 0 \\ 4-x^2 & x>0 \end{cases}$$



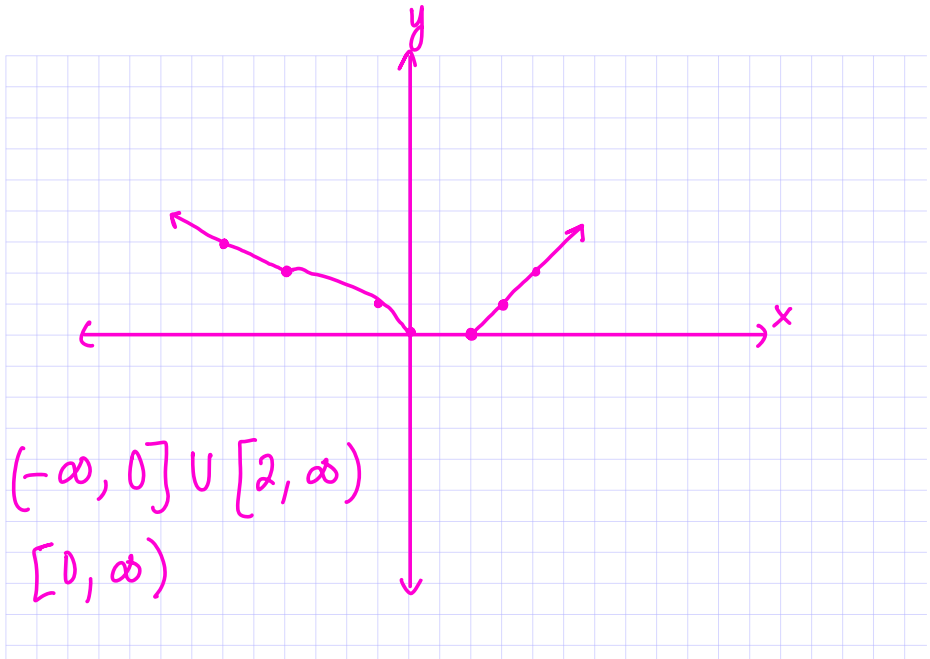
$D:(-\infty,\infty)$

$R:(-\infty,\infty)$

③ Sketch $w(x)$ and state its domain and range

$$w(x)=\begin{cases}\frac{|x|}{2}, & x\le -4 \\ \sqrt{-x}, & -4<x<2 \\ |x-2|, & x\ge 2\end{cases}$$

$\frac{|x|}{2} \rightarrow \frac{1}{2}|x|$



D: $(-\infty, 0] \cup [2, \infty)$

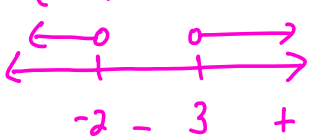
R: $[0, \infty)$

④ Given $f(x)=\frac{1}{\sqrt{x}}$ and $g(x)=x^2-x-6$, find $f(g(x))$ and its domain.

$$f(x^2-x-6)=\frac{1}{\sqrt{x^2-x-6}}$$

$x^2-x-6>0$

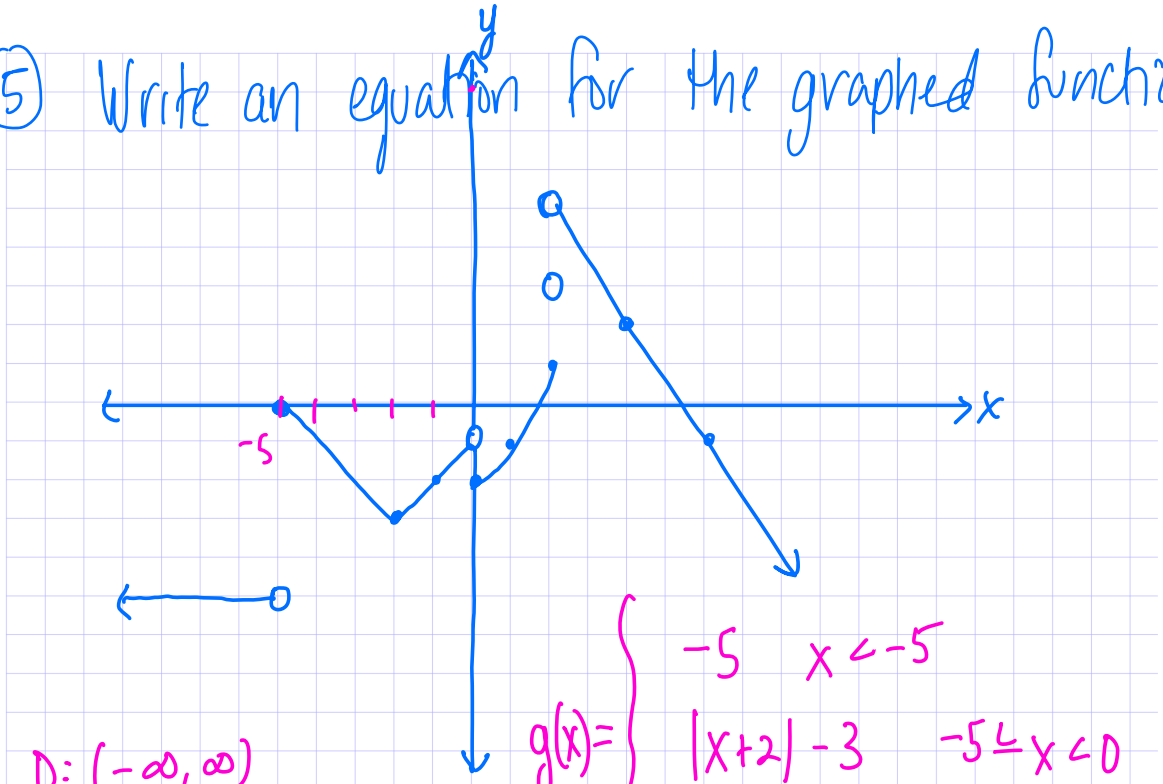
$(x-3)(x+2)>0$



$(-\infty,-2) \cup (3,\infty)$

$d_{f(g(x))}: (-\infty,-2) \cup (3,\infty)$

⑤ Write an equation for the graphed function.



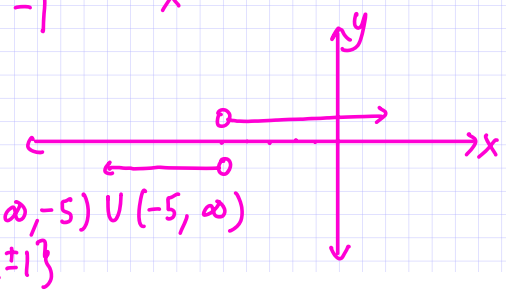
D: $(-\infty, \infty)$

R: $(-\infty, 4)$

$$g(x) = \begin{cases} -5 & x < -5 \\ |x+2| - 3 & -5 \le x < 0 \\ x^2 - 2 & 0 \le x \le 2 \\ -\frac{3}{2}x + 8 & x > 2 \end{cases}$$

⑥ Graph $f(x)$ and state it's domain and range

$$f(x) = \frac{|x+5|}{5+x} = \begin{cases} \frac{x+5}{5+x} = 1 & \text{if } x+5 > 0,\ x > -5 \\ \frac{-(x+5)}{5+x} = -1 & x < -5 \end{cases}$$



D: $(-\infty, -5) \cup (-5, \infty)$

R: $\{\pm 1\}$

Homework 10-26

Name: _____ Date: _____

PCH Ms. Loughran

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

1. $h(x) = \dfrac{x+2}{x^2+4x+5}$

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

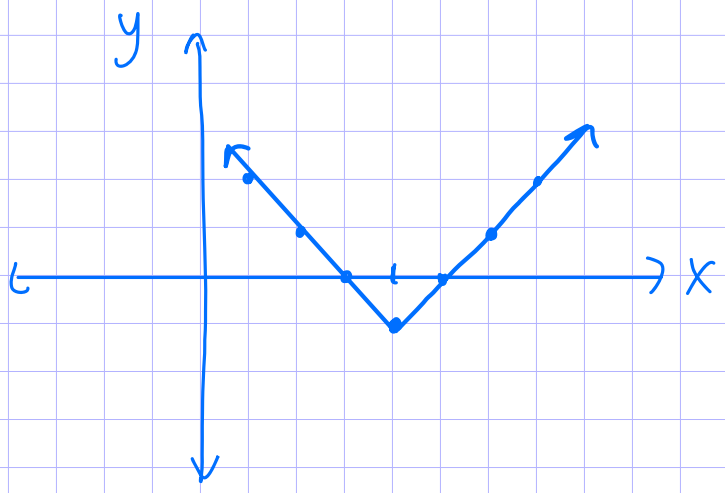
$(3x+1)^2+2$

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

$f(x) = 3x+1$

2. $f(x)=|x-4|-1$ $=$

$$\begin{cases} x-4-1 = x-5 & \text{if } x \geq 4 \\ -x+4-1 = -x+3 & \text{if } x < 4 \end{cases}$$

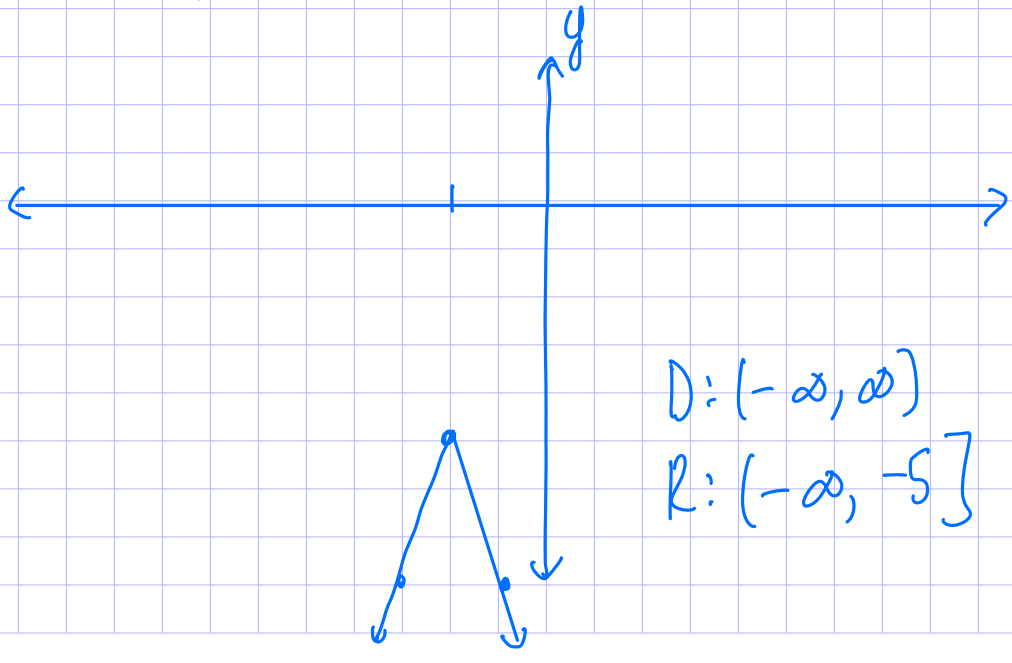


D: $(-\infty, \infty)$

R: $[-1, \infty)$

4. $f(x)=-3|x+2|-5$ $=$

$$\begin{cases} -3(x+2)-5 = -3x-11 & \text{if } x \geq -2 \\ -3(-x-2)-5 = 3x+1 & x < -2 \end{cases}$$



D: $(-\infty, \infty)$

R: $(-\infty, -5]$

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

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

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

(a) $3x+1$

a(e(x))

(b) $3x+3$

3(x+1)

e(a(x))

(e∘a)(x)

or a∘a∘a∘e

(c) $3x^2$

e∘f

(d) $9x^2$

f∘e or e∘e∘f

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

f∘b∘g

(f) $9x+3$

e∘a∘e

or a∘a∘a∘e∘e

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

h∘k∘a∘f

(h) $x+2$

x+1+1

a∘a

(i) $x-1$

b∘a or a∘b

(j) x^2-1

b∘a∘f

or a∘b∘f

(k) $3x+2$

a∘a∘e

or

b∘b∘e∘a∘a

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

k∘a∘g

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

k∘a

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

a∘k

(o) $3\sin(x)$

e∘m

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

m∘f

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

h∘k

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

h∘b∘k

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

h∘k∘b

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

k∘g or g∘k

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

(sin(3x))²

f∘m∘e

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

b∘a∘h∘g∘m or

a∘b∘h∘g∘m

(w) $\dfrac{1}{3}x$ = $\dfrac{x}{3}$ or $\dfrac{1}{\frac{3}{x}}$

h∘e∘h

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

e∘f∘m∘e

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

f∘a

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

↑ you did x-1 in (i)

f∘b∘a or

f∘a∘b

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

h∘f∘m

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

b∘h∘m∘k