Warm Up:

1. Find the smallest value in the domain of the function $f(x) = \sqrt{2x-5}$.

A) 2 B) $\frac{5}{2}$ C) 5 D) $\frac{2}{5}$

E) -2 F) 1 G) 0 H) -5

2. Find the largest value in the range of the function $f(x) = 3 - 2x^2$.

A) $-\frac{2}{3}$ B) $\frac{2}{3}$ C) 3 D) -2

E) -3 F) $-\frac{3}{2}$ G) 2 H) $\frac{3}{2}$

3. Find the domain of the function $f(x) = \dfrac{1+x}{1-x}$.

A) $(-\infty,-1)\cup(-1,\infty)$ B) $(-\infty,1)\cup(1,\infty)$ C) $(-\infty,-1)$ D) $(-1,\infty)$

E) $(-\infty,1)$ F) $(1,\infty)$ G) $(-1,1)$ H) $\mathbb{R}$

Operations With Functions

$f(x) = x^2 + 2x - 6 \qquad g(x) = 3x^2 - 4x + 2$

1. Addition $f(x) + g(x)$ OR $(f+g)(x)$

$4x^2 - 2x - 4$

2. Subtraction $f(x) - g(x)$ OR $(f-g)(x)$

$x^2 + 2x - 6 + (3x^2 - 4x + 2)$

$-2x^2 + 6x - 8$

3. Multiplication $f(x) * g(x)$ OR $(fg)(x)$

$(x^2 + 2x - 6)(3x^2 - 4x + 2)$

$3x^4 - 4x^3 + 2x^2 + 6x^3 - 8x^2 + 4x - 18x^2 + 24x$

$3x^4 + 2x^3 - 24x^2 + 28x - 12$

4. Division $\frac{f(x)}{g(x)}$ $g(x) \neq 0$ $\left(\frac{f}{g}\right)(x)$ $g(x) \neq 0$

$\frac{x^2 + 2x - 6}{3x^2 - 4x + 2}$

ex: $\frac{3x^4 + 5x + 2}{x + 1}$

$x \neq -1$

Composition of Functions

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

* always work right to left or inside to outside

Ex 1: $f(x) = 2x$ $g(x) = x^2 + 1$

$f(g(x)) =$ $2(x^2+1) = 2x^2+2$

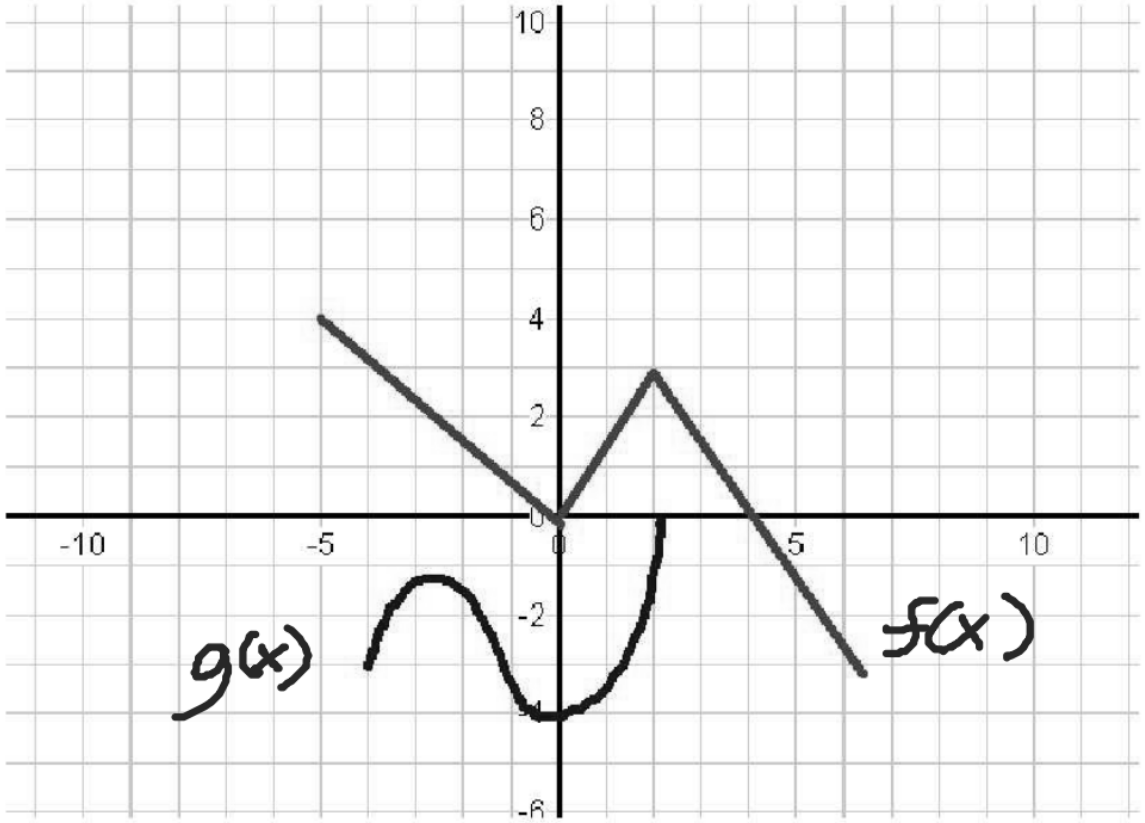
$g(f(x)) =$ $(2x)^2+1 = 4x^2+1$

Ex 2: $f(x) = x^2 + 3$ $g(x) = x^3$ $h(x) = \sin(x)$

$(h \circ g \circ f)(x) =$ $\sin(x^2+3)^3$

$(g \circ h \circ f)(x) =$ $(\sin(x^2+3))^3 = \sin^3(x^2+3)$

Ex 3:



$(f \circ g)(0) = 3$ (−4)

$(g \circ f)(3) = -2.5$

$g(f(4)) = -4$

Ex 4:

Use the given table to solve the problems listed below.

x	-3	-2	-1	0	1	2	3	4
f(x)	0	2	4	6	5	8	5	4
g(x)	3	2	0	-3	4	-1	0	2
h(x)	-2	4	-2	1	-1	-1	-3	5
j(x)	1	-3	-1	0	6	1	1	4

1. $(f \circ g)(-1) =$ 6

2. $(h \circ j)(2) =$ −1

3. $h(f(5)) =$ undefined

4. $(g \circ h \circ g)(-2) =$ 0

5. $(f \circ h \circ j)(3) =$ 4

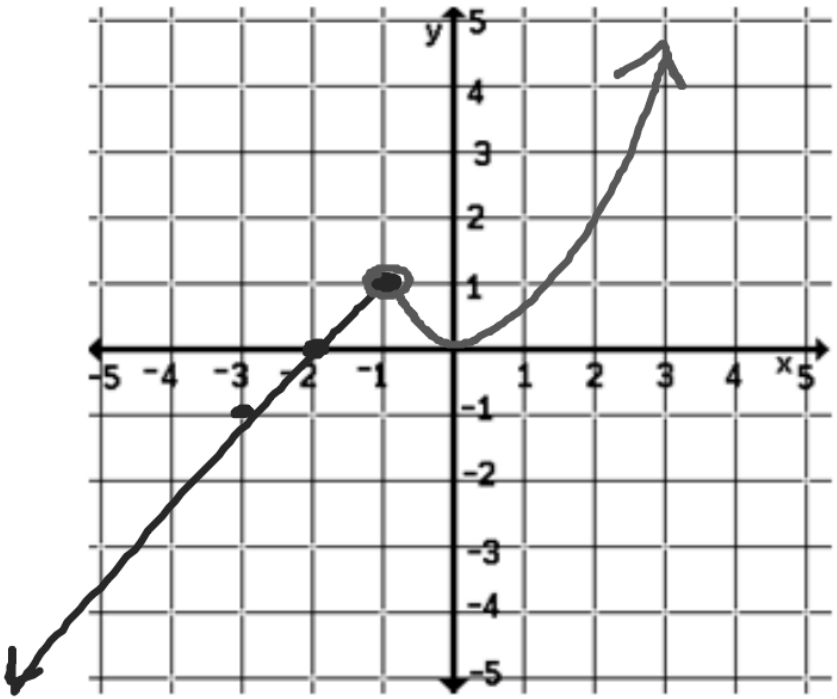
6. $(g \circ g)(-1) =$ −3

Piecewise Functions

$$f(x)=\begin{cases} x+2 & x\le -1 \\ x^2 & x>-1 \end{cases}$$

(-1, 1)

(-1, 1)



$f(-3) = -1$

$f(-1) = 1$

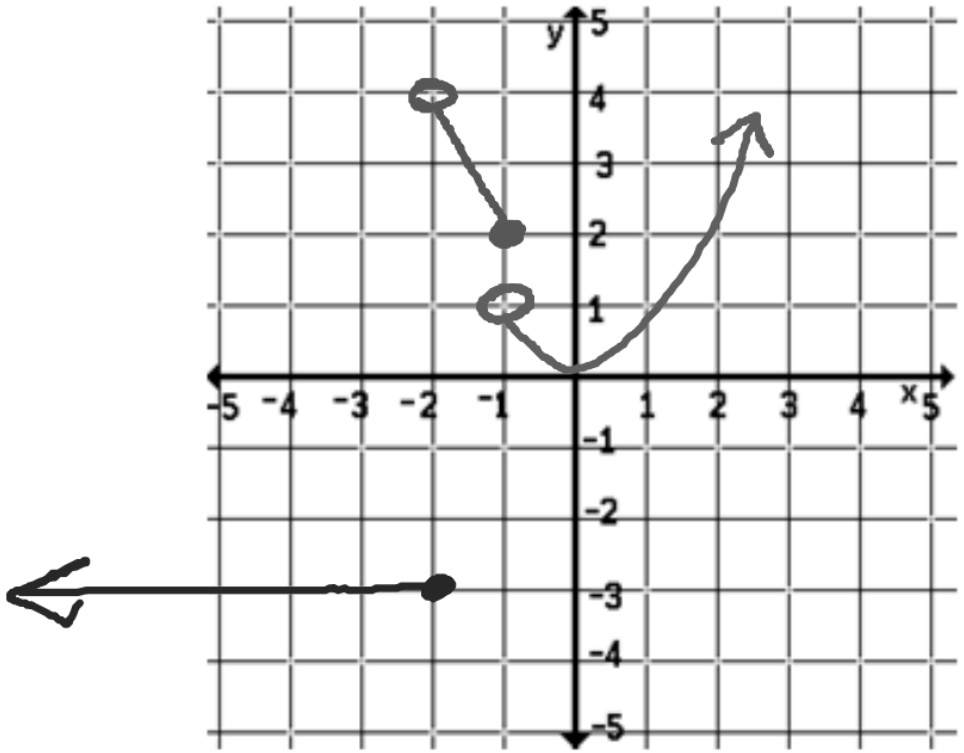
$f(0) = 0$

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

(-2, -3)

(-2, 4) (-1, 2)

(-1, 1)



$f(-3) = -3$

$f(-1) = 2$

$f(0) = 0$

AP Calculus AB
Worksheet – Functions, Domain, Range, Piecewise

Name _____

Given the function $f(x) = 3x^2 + 2x$, evaluate each function at the requested value.

$f(-2) =$

$f(-\sqrt{5}) =$

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

$f(3x^2) =$

$f(a+1) =$

$\frac{f(c+h) - f(c)}{h} =$

State the natural domain of the given functions.

$f(x) = \sqrt{x^2 - 3}$

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

$f(x) = \frac{x}{|x|}$

$g(x) = \sin\sqrt{x}$

State the natural domain and range of given functions.

$g(x) = \sqrt{4 - x^2}$

$f(x) = 3 + \sqrt{x}$

$h(x) = x^2 + 3$

$f(x) = 3\sin x$

Find the value of x given the value of the function.

$h(x) = \sqrt{3x - 2}$, $h(x) = a$, $a = 6$

$f(x) = \sin^2 x - x^2 + 4$ $f(x)$ b, $b = -3$ (use a calculator for this problem)

$$h(x) = \begin{cases} \frac{1}{x} & \text{if } x > 3 \\ 2x & \text{if } x \le 3 \end{cases}$$

$h(-4) =$ $h(4) =$ $h(3) =$ $h(t^2 + 5) =$

$$g(x) = \begin{cases} 1 & \text{if } t \le 0 \\ t + 1 & \text{if } 0 < t < 2 \\ t^2 - 1 & \text{if } t \ge 2 \end{cases}$$

$g(0) =$ $g(6) =$ $g(-2) =$