

## Questions From Homework

a)  $h(x) = f(x) \cdot g(x)$   
 $h(x) = (x-5)(2x+1)$   
 $h(x) = 2x^2 + x - 10x - 5$   
 $h(x) = 2x^2 - 9x - 5$

b) **Parabola**

c)  $y = 2x^2 - 9x - 5$

$$y + 5 = 2x^2 - 9x$$

$$y + 5 + \frac{81}{8} = 2\left(x^2 - \frac{9}{2}x + \frac{81}{16}\right)$$

$$y + \frac{40}{8} + \frac{81}{8} = 2\left(x - \frac{9}{4}\right)^2$$

$$y + \frac{121}{8} = 2\left(x - \frac{9}{4}\right)^2$$

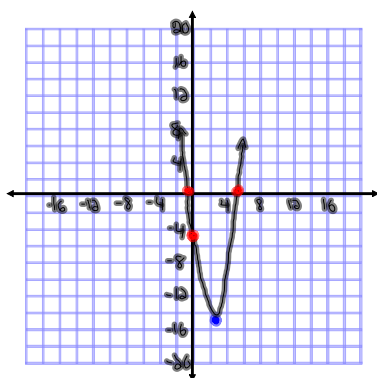
$$\frac{-9}{2} \cdot \frac{1}{2} = \left(\frac{-9}{4}\right)^2$$

$$= \frac{81}{16}$$

$$y = 2\left(x - \frac{9}{4}\right)^2 - \frac{121}{8}$$

Opens up

Vertex:  $\left(\frac{9}{4}, -\frac{121}{8}\right) \rightarrow (2.25, -15.125)$



$$y = 2x^2 - 9x - 5$$

① y-int ( $x=0$ )

$$y = 2(0)^2 - 9(0) - 5$$

$$y = -5$$

$(0, -5)$

② x-int ( $y=0$ )

$$0 = 2x^2 - 9x - 5$$

$$0 = (x-5)(2x+1)$$

$$\begin{array}{l|l} x-5=0 & 2x+1=0 \\ x=5 & 2x=-1 \\ & x=-\frac{1}{2} \end{array}$$

$(5, 0)$        $(-\frac{1}{2}, 0)$

Domain:

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

Range:

$$\{y \mid y \geq -\frac{121}{8}, y \in \mathbb{R}\}$$

$$x^2 - \underline{7}x + \underline{12}$$

$$(x-3)(x-4)$$

$$\underline{-3} \times \underline{-4} = 12$$

$$\underline{-3} + \underline{-4} = -7$$

$$\textcircled{2}x^2 - \underline{9}x - \underline{5}$$

$$(2x^2 - 10x) + (x - 5)$$

$$2x(x-5) + 1(x-5)$$

$$(2x+1)(x-5)$$

$$\underline{-10} \times \underline{1} = -10$$

$$\underline{-10} + \underline{1} = -9$$

## Composite Functions Combining Functions in a Different Way!

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

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

A new function  $h(x)$  is created when the domain of  $g(x)$  is restricted by the range of  $f(x)$

$$h(x) = f(g(x))$$

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

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

$$= 4x^2 + 4x + 1 + 6x + 3$$

$$= 4x^2 + 10x + 4$$

The notation " $f \circ g$ " means the composition of  $f$  with  $g$  and is read " $f$  composed with  $g$ ."

$$f(g(x))$$

## Composite Functions

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

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

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

**Find**

$$\begin{aligned}(f \circ g)x &= f(g(x)) \\ &= f(3x-2) \\ &= (3x-2)^2 + 5(3x-2) + 6 \\ &= 9x^2 - 12x + 4 + 15x - 10 + 6 \\ &= \boxed{9x^2 + 3x}\end{aligned}$$

$$f(x) = x^2 + 5x + 6$$

$$f(g(3))$$

$$\begin{aligned}g(3) &= 3(3) - 2 \\ &= 9 - 2 \\ &= 7\end{aligned}$$

$$\begin{aligned}f(7) &= (7)^2 + 5(7) + 6 \\ &= 49 + 35 + 6 \\ &= \boxed{90}\end{aligned}$$

$$g(f(-1))$$

$$\begin{aligned}(g \circ g)x &= g(g(x)) \\ &= g(3x-2) \\ &= 3(3x-2) - 2 \\ &= 9x - 6 - 2 \\ &= \boxed{9x - 8}\end{aligned}$$

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

$$f(g(-2))$$

$$\begin{aligned}g(-2) &= 3(-2) - 2 \\ &= -6 - 2 \\ &= -8\end{aligned}$$

$$\begin{aligned}f(-8) &= (-8)^2 + 5(-8) + 6 \\ &= 64 - 40 + 6 \\ &= \boxed{30}\end{aligned}$$

$$g(g(4))$$

# Homework