REVIEW OF FUNCTION BASICS
(SECTIONS 3.1, 3.5 & 3.6 OF PRECALCULUS TEXTBOOK)

DEFINITIONS:

DOMAIN

RANGE

FUNCTION

EXAMPLE 1: DOMAINS

Given the functions to the right.

$$f(x) = x^2 - 3x - 10$$
$$g(x) = \sqrt{9 - x^2}$$
$$j(x) = 5x + 1$$

(A) Find the domain of $f(x)$.

(B) Find the domain of $g(x)$.

(C) Find the domain of $j(x)$.

EXAMPLE 2: FUNCTION OPERATIONS

Given the functions from Example 1, find the following.

(A) $f(4)$ (B) $j(7a)$ (C) $g(x+h)$

(D) $g(\sqrt{5})$ (E) $(f+g)(0)$ (F) $(g-j)(x)$

(G) $(f \cdot j)(x)$ (H) $(fg)(3)$ (I) $\left(\frac{f}{g}\right)(x)$

(J) $\left(\frac{g}{j}\right)(x)$ (K) $\left(\frac{j}{f}\right)(3)$ (L) $\left(\frac{j}{f}\right)(-2)$

(M) $(f \circ g)(0)$ (N) $(g \circ f)(0)$ (O) $(g \circ j)(x)$

(P) $(j \circ g)(x)$

EXAMPLE 3: COMPOSITION

Given the tables below of the functions $y = f(x)$ and $y = g(x)$.

x	$f(x)$
-3	9
-2	7
-1	5
0	3
1	4
2	6
3	8

x	$g(x)$
3	-3
4	-3
5	-2
6	-2
7	0
8	3
9	3

(A) Construct a table for the function $(f \circ g)(x)$.

(B) Construct a table for the function $(g \circ f)(x)$.

EXAMPLE 4: BASIC GRAPHING AND COMPOSITIONS

Given the functions below:

$$f(x) = x^2 - 8x + 15$$
$$g(x) = |x|$$

(A) Sketch a graph of $y = f(x)$.

(B) Sketch a graph of $y = g(x)$.

(C) Sketch a graph of $y = (f \circ g)(x)$.

(D) Sketch a graph of $y = (g \circ f)(x)$.

THE DIFFERENCE QUOTIENT: $\dfrac{f(x+h)-f(x)}{h}$

EXAMPLE 5: Find the difference quotient for the following functions.

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

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

(C) $f(x)=\dfrac{5}{x}$

EXAMPLE 6: PIECEWISE FUNCTIONS

Given the piecewise functions below

$$f(x)=\begin{cases} x+3 & \text{if } x<-2 \\ x^2 & \text{if } x\geq -2 \end{cases} \qquad g(x)=\begin{cases} 2/x & \text{if } -7\leq x<-1 \\ |x| & \text{if } -1\leq x\leq 6 \\ 10-x & \text{if } x>6 \end{cases}$$

Find the following.

(A) $g(5)$ (B) $(f+g)(3)$ (C) $(fg)(-1)$

(D) $\left(\dfrac{f}{g}\right)(-2)$ (E) $(f\circ g)(-5)$ (F) $(g\circ f)(-5)$

EXAMPLE 7: INVERSES

Find the rule for the inverse of the given function. If possible, write the rule in function notation.

(A) $f(x) = 2x + 7$

(B) $f(x) = x^2 - 4$

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

(D) $f(x) = \dfrac{x - 2}{x + 3}$

EXAMPLE 8: COMPOSITION AND INVERSES

Use composition to determine whether or not the functions are inverses of one another.

(A) $f(x) = \sqrt{x+2}$ $\qquad$ $g(x) = x^2 - 2$

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