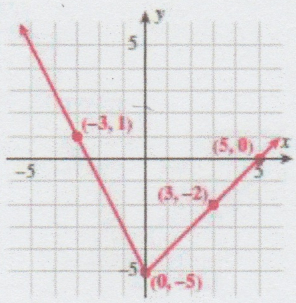
Key

Pre-Calculus Chapter 1 Practice Test

1.) (2.5 pts each, 5 pts total) Use the graph of y = g(x) to answer the following:



a) g(3) $= \boxed{-2}$

↑ x

(3, −2)

↑ when x ↳ y

b) g(0) $= \boxed{-5}$

↑ x

(0, −5)

↑ when x ↳ y

2.) (5 pts each, 10 pts total) Evaluate the given quantities applying the following four functions:

$f(x) = 2x - 3$ $\quad F(x) = 4 - x^2$ $\quad g(x) = 5 + x$ $\quad G(x) = x^2 + 2x - 7$

a) $G(-3) - F(-1)$

$x^2 + 2x - 7 - (4 - x^2)$

$(-3)^2 + 2(-3) - 7 - (4 - (-1)^2)$

$9 + (-6) - 7 - (4 - 1)$

$9 - 6 - 7 - 3$

$3 - 7 - 3 = -4 - 3 = \boxed{-7}$

b) $\frac{f(-6)}{g(4)}$

$$\frac{2(x) - 3}{5 + x} = \frac{2(-6) - 3}{5 + (4)} = \frac{-12 - 3}{9} = \frac{-15}{9} = \boxed{\frac{-5}{3}}$$

3.) (5 pts) Find the domain of the given function. Express the domain in interval notation.

a) $g(x) = \frac{\sqrt{4x-8}}{2x}$

$\sqrt{4x-8} \longrightarrow 4x-8 \geq 0$

$+8 \quad +8$

$\frac{4x}{4} \geq \frac{8}{4}$

$\boxed{x \geq 2}$

cannot have a negative square root (imaginary)

cannot have a 0 in denominator (undefined)

$2x \neq 0$

$\frac{2x}{2} \neq \frac{0}{2}$

$\boxed{x \neq 0}$

4.) (5 pts each, 10 pts total) Determine whether the function is even, odd, or neither.

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

odd function — even function

$f(x)=x^3$ is odd — $f(x)=x^2$ is even

$\boxed{\text{neither}}$

an even + odd function is $\boxed{\text{neither}}$

Even $f(-x) = f(x)$

example $f(-2) = f(2)$

$2(-2)^3 + (-2)^2 = 2(2)^3 + (2)^2$

$2(-8) + (4) = 2(8) + 4$

$-16 + 4 = 16 + 4$

$-12 \neq 20$

not even

Odd

$f(-x) = -f(x)$

$f(2) = -f(2)$

$-12 = -(20)$

$-12 \neq -20$

not odd

b) $g(x) = |x| + x^2$

even function — even function

even + even = $\boxed{\text{even}}$

Even $f(-x) = f(x)$

$f(-2) = f(2)$

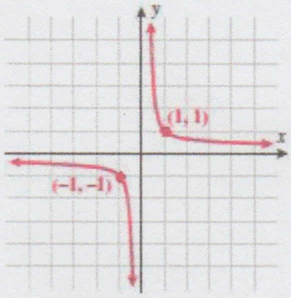
$|-2| + (-2)^2 = |2| + (2)^2$

$2 + 4 = 2 + 4$

$6 = 6$ ✓

5.) (5 pts each, 10 pts total) For each of the following graphs: Name the graph, define the domain and range, and determine whether it is even, odd, or neither.

a)



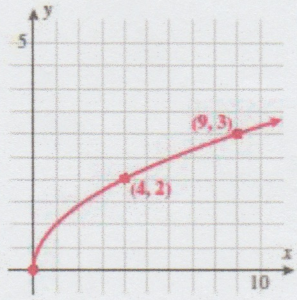
Inverse, Reciprocal

Domain: $(-\infty, 0) \cup (0, \infty)$

Range $(-\infty, 0) \cup (0, \infty)$

odd

b)



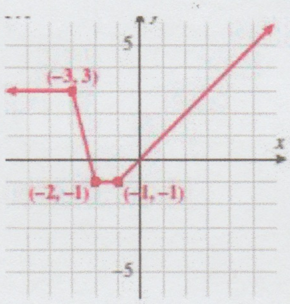
Square Root

Domain: $[0, \infty)$

Range: $[0, \infty)$

neither

6.) (5 pts) State the domain, range, and the x-intervals where the function is increasing, decreasing, or constant. Find where f(x) = 0.



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

Range: $[-1, \infty)$

increasing: $(-1, \infty)$

decreasing: $(-3, -2)$

constant: $(-\infty, -3) \cup (-2, -1)$

$f(0) = 0$

7.) (5 pts each, 10 pts total) Find the average rate of change for the function from:

x = 1 to x = 3.

$x_2 = 3 \quad x_1 = 1$

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

$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$

$\frac{(4-(3)^2) - (4-(1)^2)}{3-1}$

$\frac{(4-9) - (4-1)}{2}$

$\frac{-5-3}{2} = \frac{-8}{2} = \boxed{-4}$

b) $g(x) = \sqrt{x^2 - 1}$

$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$

$\frac{\sqrt{(3)^2-1} - \sqrt{(1)^2-1}}{3-1} = \frac{\sqrt{9-1} - 0}{2} = \frac{\sqrt{8}}{2} = \frac{2\sqrt{2}}{2} = \boxed{\sqrt{2}}$

8.) (5 pts each, 10 pts total) Find the difference quotient for the following functions:

difference quotient $\rightarrow \frac{f(x+h) - f(x)}{h}$

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

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

$x^2 + 2hx + h^2$

$\frac{((x+h)^2 + 2(x+h)) - (x^2+2x)}{h}$

$\frac{\cancel{x^2} + 2hx + h^2 + \cancel{2x} + 2h - \cancel{x^2} - \cancel{2x}}{h}$

$\frac{2hx + h^2 + 2h}{h} = \frac{\cancel{h}(2x + h + 2)}{\cancel{h}} = \boxed{2x + h + 2}$

b) $g(x) = 5x - x^2$

$\frac{5(x+h) - (x+h)^2 - (5x - x^2)}{h}$

$\frac{5x + 5h - (x^2 + 2xh + h^2) - 5x + x^2}{h}$

$\frac{\cancel{5x} + 5h - \cancel{x^2} - 2xh - h^2 - \cancel{5x} + \cancel{x^2}}{h}$

$\frac{5h - 2xh - h^2}{h}$

$\frac{\cancel{h}(5 - 2x - h)}{\cancel{h}}$

$\boxed{5 - 2x - h}$

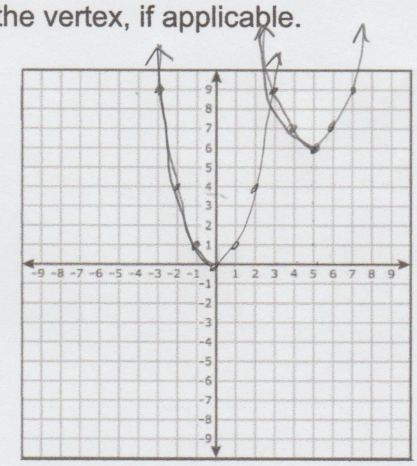
9.) (5 pts each, 10 pts total) Draw the parent function. Next, describe, in words, the transformation. Draw the function and include the vertex, if applicable.

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

vertex: (5,6)

Right 5

Up 6



b) $f(x) = |3x - 3| - 2$

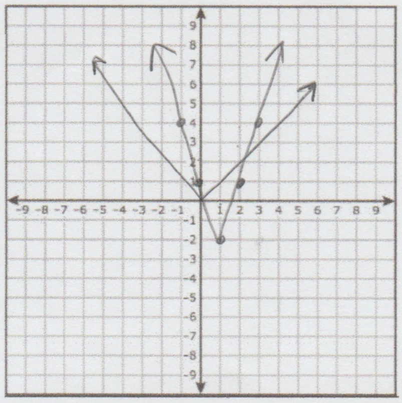
$|3(x-1)| - 2$

Vertex (1,-2)

Right 1

Down 2

Vertical Stretch 3



10.) (5 pts) Evaluate the functions for the specified values, if possible.

$$f(x) = 3x - 5 \qquad\qquad g(x) = x^2 + 2$$

a) $(f - g)(4)$

$f(4) - g(4)$

$(3(4) - 5) - ((4)^2 + 2)$

$(12 - 5) - (16 + 2)$

$7 - 18 = \boxed{-11}$

11.) (5 pts each, 10 pts total) Evaluate the functions for the specified values, if possible.

$$f(x) = 3x - 5 \qquad\qquad g(x) = x^2 + 2$$

a) $f(g(x))$

$3(x^2 + 2) - 5$

$3x^2 + 6 - 5$

$\boxed{3x^2 + 1}$

b) $(g \circ f)(1)$

$g(f(1))$

$(3x - 5)^2 + 2$

$(3(1) - 5)^2 + 2$

$(3 - 5)^2 + 2$

$(-2)^2 + 2$

$4 + 2 = \boxed{6}$

12.) (5 pts each, 10 pts total) Find the inverse of each of the following functions.

a) $f(x) = \frac{x-2}{3}$

$y = \frac{x-2}{3}$

$3(x) = \left(\frac{y-2}{3}\right)3$

$3x = y - 2$
$+2 \quad +2$

$\boxed{y = 3x + 2}$

b) $g(x) = x^2 + 6$

$y = x^2 + 6$

$x = y^2 + 6$
$-6 \quad -6$

$\sqrt{x-6} = \sqrt{y^2}$

$y = \pm\sqrt{x-6}$