Pre-Calculus Test   Chapter 1   Form A   Show ALL work!!!

1 Find the distance between the points and find the midpoint of the line segment joining the points.

(1,1) (9,7)
$x_1\ y_1\quad x_2\ y_2$

Distance: __10__

Midpoint: (__5__ , __4__)

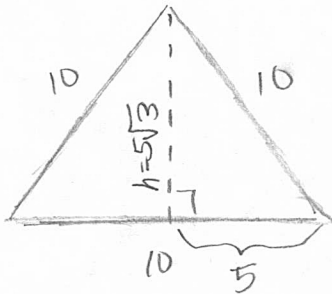$$d = \sqrt{(1-9)^2 + (1-7)^2}$$
$$= \sqrt{64+36} = \sqrt{100} = 10$$

$$M\left(\frac{1+9}{2}, \frac{1+7}{2}\right) = M(5,4)$$

2 **Geometry** A "Slow Moving Vehicle" sign has the shape of an equilateral triangle. The sign has a perimeter of 30 centimeters. Find the area of the sign.

A = __$25\sqrt{3}$__ cm²

$$5^2 + h^2 = 10^2$$
$$25 + h^2 = 100$$
$$-25 \qquad -25$$
$$\sqrt{h^2} = \sqrt{75} \qquad h = 5\sqrt{3}$$

$$A = \frac{1}{2}(10)(5\sqrt{3})$$

$$\boxed{A = 25\sqrt{3}\ cm^2}$$

3 Find the x- and y-intercepts of the graph of the equation.

$$y = \sqrt{x+4}$$

x-intercept: (__-4__ , __0__)

y-intercept: (__0__ , __2__)

x-intercept
$$y = 0$$
$$(0)^2 = (\sqrt{x+4})^2$$
$$0 = x+4$$
$$-4 \quad -4$$
$$x = -4$$

y-intercept
$$x = 0$$
$$y = \sqrt{0+4}$$
$$y = \sqrt{4} = 2$$

4 Write the standard form of the equation of a circle using the given information.

Center: (3,−2); solution point: (−1,1)
(with $h\ k$ over center, $x\ y$ over solution point)

Equation of Circle: __$(x-3)^2 + (y+2)^2 = 25$__

$$(x-h)^2 + (y-k)^2 = r^2$$
$$(-1-3)^2 + (1-(-2))^2 = r^2$$
$$(-4)^2 + (3)^2 = r^2$$
$$16 + 9 = r^2$$
$$\sqrt{25} = \sqrt{r^2}$$
$$r = 5$$
$$(x-3)^2 + (y-(-2))^2 = 5^2$$

5 Write the slope-intercept forms of the equations of the lines through the given point **(a)** parallel to the given line and **(b)** perpendicular to the given line.

Point	Line
(2,1)	$4x - 2y = 3$

(a) $\underline{\quad y = 2x - 3 \quad}$

(b) $\underline{\quad y = -\frac{1}{2}x + 2 \quad}$

$4x - 2y = 3$
$-4x \qquad -4x$

$\dfrac{-2y}{-2} = \dfrac{-4x+3}{-2}$

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

Parallel

$y = 2x + b$

$1 = 2(2) + b$

$1 = 4 + b$

$-4 \quad -4$

$-3 = b$

Perpendicular

$y = -\frac{1}{2}x + b$

$1 = -\frac{1}{2}(2) + b$

$1 = -1 + b$

$+1 \quad +1$

$b = 2$

6 Evaluate the function at each specified value of the independent variable and simplify.

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

$f(-2) = \underline{\;-7\;}$ $\qquad 3(-2) - 1 = -7$

$f\left(-\dfrac{1}{2}\right) = \underline{\;4\;}$

$f(3) = \underline{\;9\;}$ $\qquad (3)^2 = 9$

7 Find the different quotient and simplify your answer.

$$f(x) = x^2 - x + 1, \quad \frac{f(2+h) - f(2)}{h}, h \ne 0$$

Answer: $\underline{\quad h + 3 \quad}$

$$\frac{(2+h)^2 - (2+h) + 1 - [2^2 - 2 + 1]}{h}$$

$$= \frac{4 + 4h + h^2 - 2 - h + 1 - 3}{h}$$

$$= \frac{h^2 + 3h}{h} = \frac{h(h+3)}{h} = h + 3$$

8 **Path of a Ball** The height y (in feet) of a baseball thrown by a child is

$$y = -\frac{1}{10}x^2 + 3x + 6$$

Where x is the horizontal distance (in feet) from where the ball was thrown. Will the ball fly over the head of another child 30 feet away trying to catch the ball? (Assume that the child who is trying to catch the ball holds a baseball glove at a height of 5 feet.)
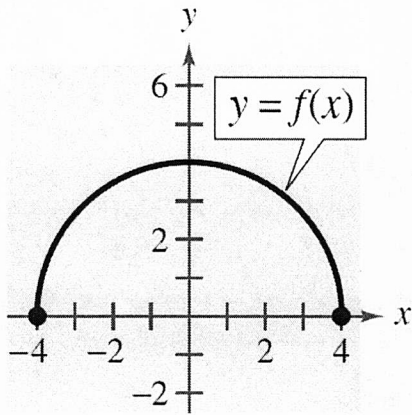
(Yes) or No

$y = -\frac{1}{10}(30)^2 + 3(30) + 6$

$= -\frac{1}{10}(900) + 90 + 6$

$= -90 + 90 + 6$

$y = 6$

2

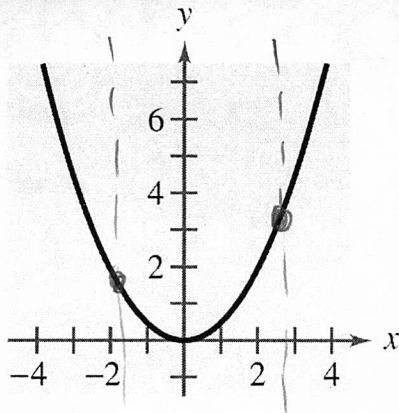9   Describe the domain and the range of the graph using <u>interval notation</u>. Ex: $[-5, 7)$

$y = f(x)$

Domain: $[-4, 4]$

Range: $[0, 4]$

10   Is y a function of x? State the reason for your answer.

$y = \dfrac{1}{2}x^2$

(Yes) or No

Reason: The equation passes the Vertical Line Test

11   Evaluate the function for the given values.
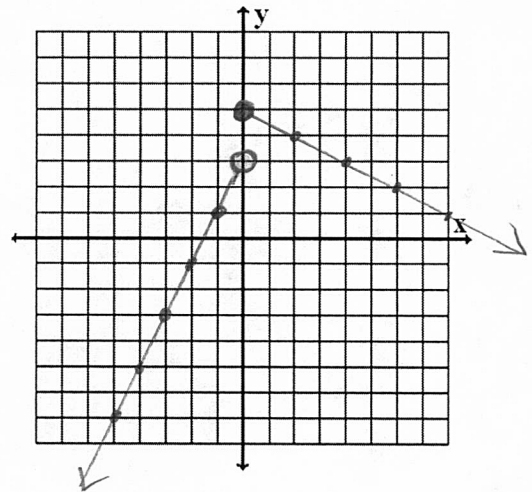$f(x) = [\![x]\!]$

$f(2.1) = \underline{\quad 2 \quad}$

$f(2.9) = \underline{\quad 2 \quad}$

$f(-3.1) = \underline{\quad -4 \quad}$

$f\left(\dfrac{7}{2}\right) = \underline{\quad 3 \quad}$

12   Graph the piecewise function.

$$f(x) = \begin{cases} 2x + 3, & x < 0 \\ -\dfrac{1}{2}x + 5, & x \geq 0 \end{cases}$$
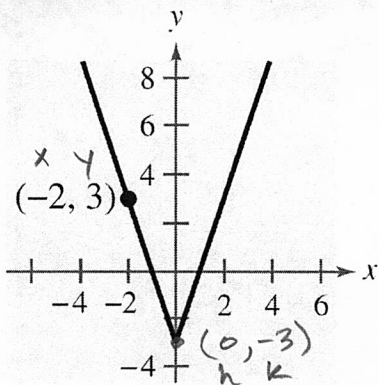

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13 Write an equation for the function shown in the graph.
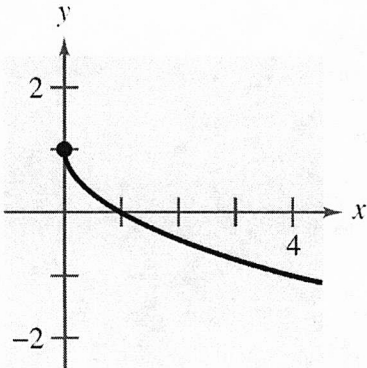
$f(x) = \underline{-\sqrt{x} + 1}$

Shift: 1 unit up

Reflection: Over horizontal line passing through starting point.

14 Write the equation for the function shown in the graph. **Important:** Dont forget to find the "a" when constructing the equation.

$f(x) = \underline{y = 3|x| - 3}$
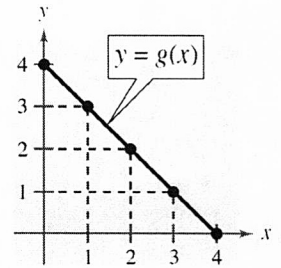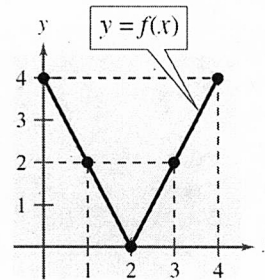
$y = a|x - h| + k$

$y = a|x - 0| - 3$

$y = a|x| - 3$

$3 = a|-2| - 3$

$3 = 2a - \cancel{3}$
$+3 \qquad +3$

$\dfrac{6}{2} = \dfrac{2a}{2} \quad a = 3$

15 Use the graphs of f and g to evaluate the function.
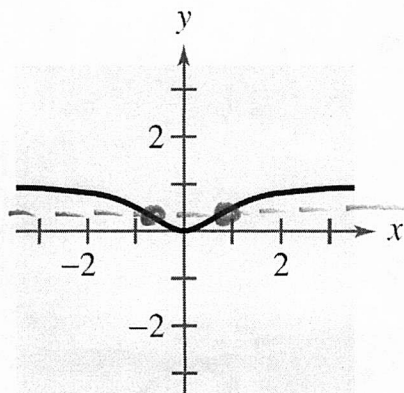

$(f \circ g)(2) = \underline{0}$

$f(g(2))$

$f(2) = 0$

16 Find two functions f and g such that $(f \circ g)(x) = h(x)$.

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

$f(x) = \underline{x^2} \qquad g(x) = \underline{2x + 1}$

4

17 Does the function have an inverse function? State the reason for your answer.

Yes   or   (No)

Reason: The graph does not pass the horizontal line test

18 Factor completely.

$27x^3 + 8$

$3^3 x^3 + 2^3$

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

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

$= \boxed{(3x+2)(9x^2 - 6x + 4)}$

19 Find the inverse function of f.

$f(x) = 2x - 3$
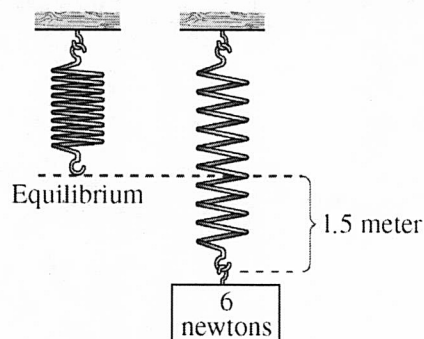
$f^{-1}(x) = \dfrac{x+3}{2}$

$y = 2x - 3$

Inverse:

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

$\dfrac{x+3}{2} = \dfrac{2y}{2} \qquad y = \dfrac{x+3}{2}$

20 **Hooke's Law** Use Hook's Law for springs, which states that the distance a spring is stretched (or compressed) varies directly as the force of the spring.

A force of 6 newtons stretches a spring 1.5 meters. How far will a force of 28 newtons stretch the spring?

Equilibrium

1.5 meter

6 newtons

$d = \underline{\quad 7 \quad}$

$d = kF \qquad\qquad d = .25F$

$\dfrac{1.5}{6} = \dfrac{k(6)}{6} \qquad d = .25(28)$

$k = .25 \qquad\qquad d = 7$

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