

Name: \_\_\_\_\_

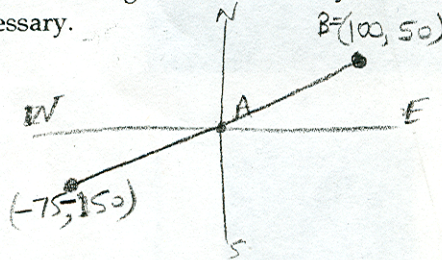
KEY

Date: \_\_\_\_\_

1) City B is located at 100 miles east and 50 miles north of city A. City C is located at 75 miles west and 150 miles south of city A. Find the distance between city B and city C. You can choose city A as the origin of the rectangular coordinate system. Write your answer rounded to two decimal places, if necessary.

$$d = \sqrt{(50+150)^2 + (100-75)^2}$$

$$= \boxed{265.75 \text{ miles}}$$



(5 points)

2) Find the midpoint of the line segment whose endpoints are  $(-8, 4)$  and  $(-4, 8)$ .

$$M = \left( \frac{-8 + -4}{2}, \frac{8 + 4}{2} \right) = \boxed{(-6, 6)}$$

(5 points)

3) If  $(3, b)$  is a point on the graph of  $3x - 2y = 17$ , what is  $b$ ?

$$3(3) - 2(b) = 17 \quad b = \frac{17-9}{-2} = \frac{8}{-2} = \boxed{-4}$$

(5 points)

Find the x- and y-intercepts of the equation. Write answer as ordered pairs.

4) Find the x- and y-intercepts of  $3x^2 - 10x - 8 - y = 0$

$$y_{\text{int}} = (0, -8)$$

$$x_{\text{int}} = \left(-\frac{2}{3}, 0\right) \text{ \& } (4, 0)$$

(5 points)

Write the standard form of the equation for the circle.

5) Give the equation for a circle. Center at  $(5, 8)$ , radius 7

$$(x-h)^2 + (y-k)^2 = r^2$$

$$(x-5)^2 + (y-8)^2 = 49$$

 $(5, 8)$  $(h, k)$ 

(5 points)

Find the center and radius of the circle with the given equation.

6)  $4x^2 + 4y^2 - 24x + 16y - 20 = 0$

$$x^2 + y^2 - 6x + 4y - 5 = 0$$

$$x^2 - 6x + 9 + y^2 + 4y + 4 = 5 + 9 + 4$$

$$(x-3)^2 + (y+2)^2 = 18 \quad ;$$

Center  $(3, -2)$

$$\text{radius} = \sqrt{18} = 3\sqrt{2}$$

Solve:

7)  $1 - \frac{9}{5x} = \frac{7}{3}$

$$15x - 27 = 35x$$

$$-27 = 20x$$

$$x = \frac{-27}{20}$$

Use the quadratic formula to solve the equation.

8)  $4x^2 + 12x = -2$

$$4x^2 + 12x + 2 = 0 \quad a=4 \quad b=12 \quad c=2$$

$$x = \frac{-12 \pm \sqrt{144 - 4(4)(2)}}{2(4)} = \frac{-12 \pm \sqrt{112}}{8} = \frac{-12 \pm 4\sqrt{7}}{8} = \frac{-3 \pm \sqrt{7}}{2}$$

Solve:

9)  $\sqrt{2x+3} - \sqrt{x+1} = 1$

$$\sqrt{2x+3} = 1 + \sqrt{x+1}$$

$$2x+3 = (1+\sqrt{x+1})(1+\sqrt{x+1})$$

$$2x+3 = x + \sqrt{x+1} + x + 1$$

$$x+1 = 2\sqrt{x+1}$$

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

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

$$x^2 + 2x - 4x + 1 - 4 = 0$$

$$x^2 - 2x - 3 = 0$$

$$(x-3)(x+1) = 0$$

$$x=3 \quad x=-1$$

(7 Points)

(5 Points)

(5 Points)

(8 Points)

10) A real estate agent earns a commission of 7.5% of the selling price of every house that she sells. She is currently negotiating a contract on a house she expects the final selling price to be between \$114,000 and \$119,000 inclusive. Over what range does the agent's commission vary?

$$\$8550 \leq X \leq \$8925$$

(5 pts)

Solve the inequality.

11)  $|g - 7| < 9$

$$\begin{array}{ccc} -9 < g - 7 < 9 \\ +7 & +7 & +7 \end{array}$$

$$-2 < g < 16$$

(5 pts)

12) Write an equation of the line passing through the point (2, 1) and perpendicular to the line  $y = -4x - 5$ .

$$m = \frac{1}{4}$$

$$y - 1 = \frac{1}{4}(x - 2)$$

$$y = \frac{1}{4}x - \frac{1}{2} + 1$$

$$y = \frac{1}{4}x + \frac{1}{2}$$

(8 pts)

13) Each month a gas station sells  $x$  gallons of gas at \$1.92 per gallon. The cost to the owner of the gas station for each gallon of gas is \$1.32, and the monthly fixed cost for running the gas station is \$37,000.

(10 pts)

a) Find the cost function. (Hint: Cost = variable cost + fixed cost)

$$C(x) = 1.32x + 37000 \quad \text{Dollars}$$

b) Find the revenue function. (Hint: Revenue = price \* quantity)

$$R(x) = 1.92x \quad \text{dollars}$$

c) Write an equation that relates the monthly profit, in dollars, to the number of gallons of gasoline sold. (Hint: Profit = Revenue - Cost)

$$P(x) = 1.92x - 1.32x - 37000 = 0.6x - 37000 \quad \text{Dollars}$$

d) Use the equation to find the monthly profit when 75,000 gallons of gas are sold in a month.

$$P(75000) = 45000 - 37000 = \$8000$$

14) A truck rental company rents a moving truck one day by charging \$31 plus \$0.09 per mile. Write a linear equation that relates the cost  $C$ , in dollars, of renting the truck to the number  $x$  of miles driven. What is the cost of renting the truck if the truck is driven 210 miles?

(5 pts)

$$C(x) = 0.09x + 31 \quad \text{Miles}$$

$$C(210) = 0.09(210) + 31 = \$49.9$$

15) Find the value of  $\frac{f(x+h) - f(x)}{h}$ ,  $h \neq 0$  for the function  $f(x) = 4x^2 - 5$ .

(Clearly state each step of the process).

(10 pts)

$$f(x+h) = 4(x+h)^2 - 5 = 4(x^2 + 2xh + h^2) - 5 = 4x^2 + 8xh + 4h^2 - 5$$

$$\frac{f(x+h) - f(x)}{h} = \frac{4x^2 + 8xh + 4h^2 - 5 - (4x^2 - 5)}{h} = \frac{h(8x + 4h)}{h}$$

$$= 8x + 4h$$

16) Given  $f(x) = -4x^2 + 3x + 15$ , Find  $x$  such that  $f(x) = -7$

$$-4x^2 + 3x + 15 = -7$$

$$-4x^2 + 3x + 22 = 0$$

$$x = -2 \quad \text{and} \quad x = 2.75$$

17) Give the domain of the function.

a)  $f(x) = 3x^2 + 2x + 5$

All Reals

b)  $f(x) = \sqrt{10-x}$

$$10 - x \geq 0$$

$$10 \geq x$$

c)  $f(x) = \frac{(x-7)}{(x-6)(x-7)}$

All Real except  $x=6$  and  $x=7$

d)  $g(x) = \frac{-5-x}{\sqrt{-5-x}}$

$$-5 - x > 0$$

$$-5 > x$$

Find the average rate of change for the function over the

18)  $f(x) = x^2 + x$  between  $x=6$  and  $x=8$

$$(6, 42) \quad (8, 72)$$

Avg Rate of Change

between

$x=6$  and  $x=8$

$$= \frac{72 - 42}{8 - 6} = \frac{30}{2} = 15$$

- 19) David has available 400 yards of fencing and wishes to enclose a rectangular area. (10 points)

a) Express the area  $A$  of the rectangle as a function of the width  $x$  of the rectangle.



$$2x + 2y = 400 \Rightarrow y = 200 - x$$

$$A = x \cdot y = x(200 - x) = 200x - x^2$$

b) What is the domain of  $A$ ?

$$0 < x < 200$$

- 20) Let  $P = (x, y)$  be a point on the graph of  $y = x^2 - 8$  (10 points)

a) Express the distance  $d$  from  $P$  to the origin as a function of  $x$ .

$$\begin{matrix} (x, y) \\ (0, 0) \end{matrix}$$

$$d = \sqrt{(x-0)^2 + (y-0)^2} \Rightarrow d = \sqrt{x^2 + (x^2 - 8)^2}$$

b) What is  $d$  if  $x = 0$ ?

$$d = \sqrt{(-8)^2} = 8$$

c) What is  $d$  if  $x = 1$ ?

$$d = \sqrt{1 + (1-8)^2} = \sqrt{1 + 49} = \sqrt{50}$$

d) Use your calculator to graph  $d(x)$

e) For what values of  $x$  is  $d$  smallest?

$$x \approx 2.7$$

- 21) Write the function whose graph is the graph of  $y = x^3$ , but is (10 points)

a) Shifted to the right 4 units

$$y = (x - 4)^3$$

b) Shifted up 4 units

$$y = x^3 + 4$$

c) Reflected about the  $y$ -axis

$$y = (-x)^3 = -x^3$$

d) Vertically stretched by a factor of 4

$$y = 4x^3$$