

**Math 100**  
**Midterm Exam**

Name \_\_\_\_\_  
Section \_\_\_\_\_ Date \_\_\_\_\_ Score \_\_\_\_\_

**Show all work for full credit!**

1. Given the set  $\{-1, 0, \frac{1}{4}, 1, 11.6, \sqrt{7}, 3\pi\}$ , list the numbers in this set that belong to the following:

a. set of irrational numbers.

$\sqrt{7}, 3\pi$   
2 points

b. set of whole numbers

$0, 1$   
2 points

2. Simplify the expression.

$$\frac{6(-2)^2 + 2(3-8)}{1+2 \cdot 3 - \sqrt{36}} = \frac{6(4) + 2(-5)}{1+6-6}$$

$$= \frac{24-10}{1} = 14$$

14  
5 points

3. Identify the property illustrated.

a)  $8+0=8$

Identity of Addition  
2 points

b)  $6(8+5)=6 \cdot 8+6 \cdot 5$

Distributive  
2 points

4. Solve  $\frac{3x-1}{4} + \frac{x+3}{6} = 3$

$$24\left(\frac{3x-1}{4}\right) + 24\left(\frac{x+3}{6}\right) = 24 \cdot 3$$

$$6(3x-1) + 4(x+3) = 72$$

$$18x-6 + 4x+12 = 72$$

$$22x+6 = 72$$

$$22x = 66$$

$$x = 3$$

235  
4 points

5. a) Solve:  $4(x-5) = 5x - (x-20)$

$$4x-20 = 5x-x+20$$

$$4x-20 = 4x+20$$

$$0 \neq 40$$

$\emptyset$   
4 points

- b) Classify the equation in a) as a conditional, an identity or a contradiction.

Contradiction  
1 point

6. Let  $A = \{1, 2, 3, 4, 5, 6\}$   $B = \{4, 6, 8\}$   $C = \{8, 9\}$

a. Find  $B \cup C$

$$\underline{\underline{\{4, 6, 8, 9\}}}$$

2 points

b. Find  $A \cap C$

$$\underline{\underline{\emptyset}}$$

2 points

c. Find  $A \cap B$

$$\underline{\underline{\{4, 6\}}}$$

2 points

7. Solve this equation for  $a$ :  $3a + 10 = 6c$

$$3a = 6c - 10$$

$$a = \frac{6c - 10}{3} \text{ or } a = 2c - \frac{10}{3}$$

3 points

8. Write an equation or inequality that represents the problem, then solve:

(4 points)

When 2 is added to two-thirds of a number the result is 7 less than the number.

$$2 + \frac{2}{3}n = n - 7$$

$$9 = \frac{1}{3}n$$

$$27 = n$$

Equation/inequality:  $\underline{\underline{2 + \frac{2}{3}n = n - 7}}$

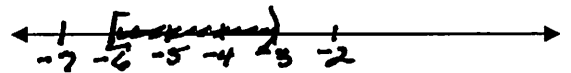
Solution:  $\underline{\underline{n = 27}}$

9. Solve the compound inequality. Graph and give the solution set in **interval notation**. (4 points)

$$1 - 2x > 7 \text{ and } 8 + 3x \geq -10$$

$$-2x > 6 \quad 3x \geq -18$$

$$x < -3 \text{ and } x \geq -6$$



$$\underline{\underline{[-6, -3)}}$$

10. Find the x-intercept and the y-intercept for the equation  $4x + 3y = -12$ . State each intercept as an ordered pair. Graph the equation. (5 points)

x-intercept:  $\underline{\underline{(-3, 0)}}$  y-intercept:  $\underline{\underline{(0, -4)}}$

$$4x + 3(0) = -12$$

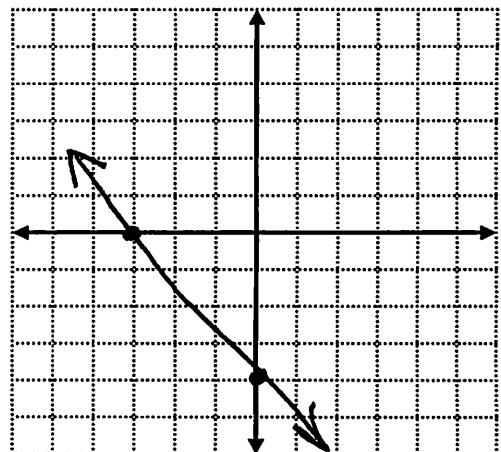
$$4x = -12$$

$$x = -3$$

$$4(0) + 3y = -12$$

$$3y = -12$$

$$y = -4$$



11. a. Find the slope of the line through (-6, 5) and (-4, -1) if it exists.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \frac{-1 - 5}{-4 - -6} = \frac{-6}{2} = -3$$

$$\underline{m = -3}$$

3 points

- b. Write the equation of the line in slope-intercept form.

$$\begin{aligned} y - 5 &= -3(x - -6) \\ y - 5 &= -3x - 18 \\ y &= -3x - 13 \end{aligned}$$

$$\underline{y = -3x - 13}$$

3 points

- c. Find the midpoint of the segment with the above endpoints.

$$\begin{aligned} M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) & \quad M\left(\frac{-6 + -4}{2}, \frac{5 + -1}{2}\right) \\ & \quad M\left(\frac{-10}{2}, \frac{4}{2}\right) \end{aligned}$$

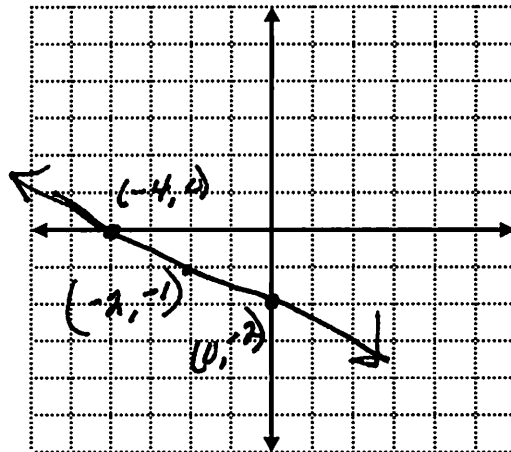
$$\underline{M(-5, 2)}$$

3 points

12. Find the slope of the line and use the slope to sketch the graph. (5 points)

$$x + 2y = -4$$

$$\begin{aligned} 2y &= -x - 4 \\ y &= -\frac{1}{2}x - 2 \end{aligned}$$



13. Find an equation in slope-intercept form of the line perpendicular to  $3x - y = 6$  and passing through the point (2, -4).

$$\begin{aligned} -y &= -3x + 6 \\ y &= 3x - 6 \\ m &= 3 \end{aligned}$$

$$m_{\perp} = -\frac{1}{3}$$

$$\begin{aligned} (y + 4) &= -\frac{1}{3}(x - 2) \\ y &= -\frac{1}{3}x + \frac{2}{3} - 4 \\ y &= -\frac{1}{3}x + \frac{2}{3} - \frac{12}{3} \end{aligned}$$

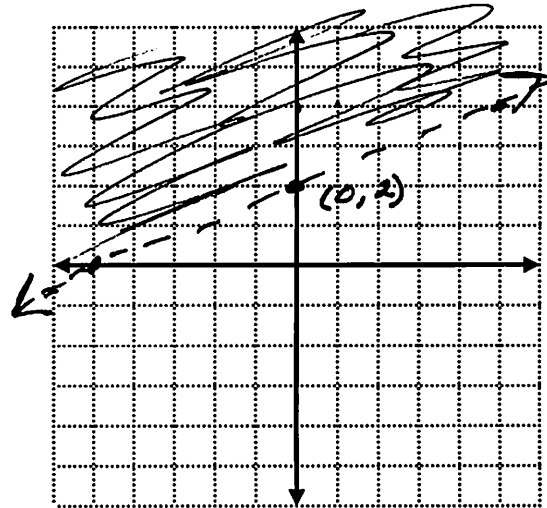
$$\underline{y = -\frac{1}{3}x - \frac{10}{3}}$$

5 points

14. Graph the inequality  $2x - 5y < -10$  (5 points)

$$-5y < -2x - 10$$

$$y > \frac{2}{5}x + 2$$



15. Determine whether the relation is a function or not a function. Explain. (3 points)

$\{(3, 4), (1, 2), (3, 7)\}$  Not a function

The domain value 3 corresponds to two different range values 4 and 7.

Domain:  $\{1, 3\}$   
1 point

Range:  $\{2, 4, 7\}$   
1 point

16. Let  $f(x) = -2x + 3$  and  $g(x) = -x^2 + 4x + 1$  Find the following:

a.  $g(-4) = -(-4)^2 + 4(-4) + 1 = -16 - 16 + 1$

$-31$   
2 points

b.  $f(a-4) = -2(a-4) + 3 = -2a + 8 + 3$

$-2a + 11$   
2 points

17. Solve the system by substitution. Write your answer as an ordered pair.

$x + 4y = 13 \Rightarrow x = 13 - 4y$

$3x - 2y = 18$

$3(13 - 4y) - 2y = 18$

$39 - 12y - 2y = 18$

$39 - 14y = 18$

$-14y = -21$

$y = \frac{-21}{-14} = \frac{3}{2}$

$(7, \frac{3}{2})$   
5 points

$x = 13 - 4(\frac{3}{2})$

$x = 13 - 6$

$x = 7$

18. Solve the system by **elimination**. Write your answer as an ordered pair.

$$\begin{aligned} 3x - 2y &= 0 \\ 9x + 8y &= 7 \end{aligned}$$

$$\begin{aligned} 12x - 8y &= 0 \\ \underline{9x + 8y} &= 7 \end{aligned}$$

$$\begin{aligned} 21x &= 7 \\ x &= \frac{7}{21} = \frac{1}{3} \end{aligned}$$

$$\begin{aligned} 3\left(\frac{1}{3}\right) - 2y &= 0 \\ 1 - 2y &= 0 \\ -2y &= -1 \\ y &= \frac{1}{2} \end{aligned}$$

$$\underline{\left(\frac{1}{3}, \frac{1}{2}\right)}$$

5 points

19. Write and solve a system of equations to answer the following.

A souvenir stand sold 42 t-shirts in one day. All short sleeve shirts cost \$12 each and all long sleeve shirts cost \$18 each. If \$612 was the total amount collected from the sale of the t-shirts, find the number of each type of t-shirt sold. (6 points total)

$x$  = number of short sleeve shirts  
 $y$  = number of long sleeve shirts

$$\begin{aligned} x + y &= 42 \\ \underline{12x + 18y} &= 612 \\ -12x - 12y &= -504 \end{aligned} \quad \begin{aligned} &6y = 108 \\ &y = 18 \\ x + 18 &= 42 \\ x &= 24 \end{aligned}$$

Number of short sleeve t-shirts sold 24

Number of long sleeve t-shirts sold 18

20. Complete the following statements:

a. The sum of two negative numbers is negative  
1 point

b. The slope of a horizontal line is 0  
2 points

c. The domain of  $y = \sqrt{x+5}$  is  $[-5, \infty)$   
2 points

d. Write  $-5 < x \leq 3$  in interval notation.  $(-5, 3]$   
2 points