

Name and section: \_\_\_\_\_

Instructor's name: \_\_\_\_\_

- **Please do not open exam until instructed to begin.**
- This exam is to be completed in the allotted time period of 2 hours.
- There are 20 problems which appear on the fronts and backs of the pages of this exam.
- You may earn a total of 100 points.
- Read each question carefully.
- Credit may not be given without sufficient supporting work.
- Simplify answers when possible.
- The use of cell phones, books, or notes are not permitted while taking this exam.
- Approved calculators are allowed.

1. [5 points] A rectangle has a length of 18 inches and an area of 72 square inches. Find the **width** and the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

2. [5 points] Simplify  $-5[3x^2 - (8x^2 - 2y)]$ .

3. [5 points] Solve for  $m$ . Simplify your answer.

$$32m + 28 - 12m = 10 - 14m$$

4. [4 points] Solve the following equation for  $y$ .

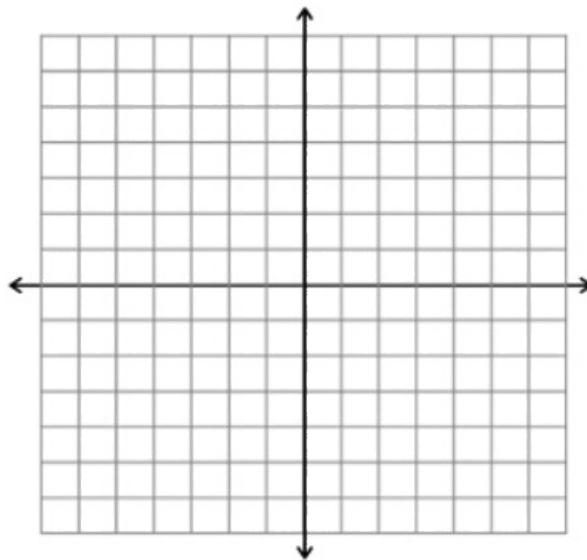
$$\frac{1}{3}(y - 12) = \frac{1}{6}y + 4$$

5. [5 points] Write the following verbal statement in algebraic form. “12 minus  $x$  equals two times the quantity of five minus two times  $x$ ”
6. [5 points] The average weekday high temperature last week was  $83^\circ$ . The high temperatures on Monday through Thursday were  $75^\circ$ ,  $78^\circ$ ,  $84^\circ$ , and  $87^\circ$ . What was the high temperature on Friday?
7. [5 points] Solve and graph on the number line.

$$\frac{1}{3}x - 1 \geq \frac{5}{6}x$$



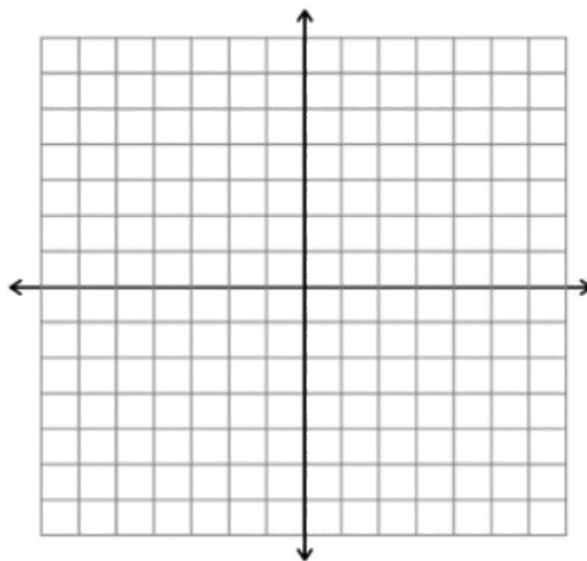
8. [5 points] Graph the line with a slope  $-\frac{3}{4}$  that passes through the point  $(-1, 2)$ . Be sure to label axes with  $x$ ,  $y$ , and with numbers. Identify at least three points on your line.



9. [5 points] Find the equation of the line that passes through  $(-8, -7)$  and is perpendicular to the line  $y = 8x + 2$ .

10. [5 points] Solve by graphing the given system of equations. Be sure to label axes with  $x$ ,  $y$ , and with numbers. Identify and label the intersection point.

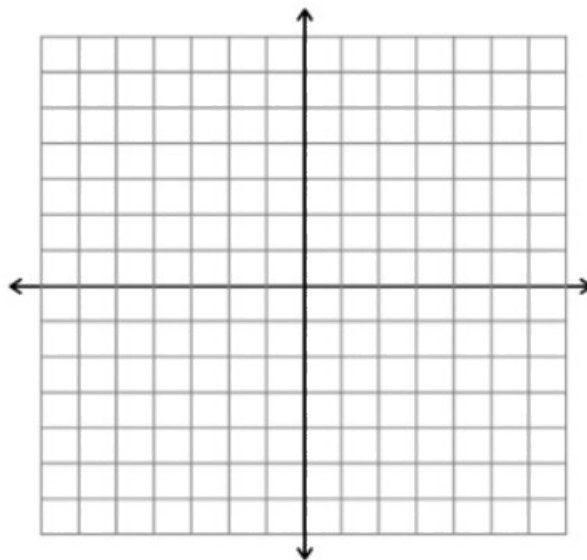
$$\begin{cases} 3x - 2y = 6 \\ 4x + y = -3 \end{cases}$$



11. [6 points] On Wednesday, Gabriel picked up 10 cookies and 30 cups of hot cider for the office staff and paid a total of \$56.60. On Tuesday, Gabriel picked up 9 cookies and 18 cups of hot cider (from the same coffee shop) and paid a total of \$38.43. How much does the coffee shop charge for one cookie? How much do they charge for one cup of hot cider?

12. [5 points] Graph the solution to the system of inequalities. Be sure to label the  $x$  and  $y$  axes.

$$\begin{cases} y \geq -x - 3 \\ y < -5 \end{cases}$$



13. [5 points] Multiply and simplify your answer.

$$6x^3y^8z^4 \cdot 3x^7y^9z^{13} \cdot 5x^{10}$$

14. [5 points] Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$$\frac{x^{-4}y^{-2}z^4}{z^{-5}}.$$

15. [5 points]

(a) Write  $2.4 \times 10^{-5}$  in decimal notation.

(b) Write  $4.31 \times 10^6$  in decimal notation.

16. [5 points] Identify the degree and leading coefficient of the polynomial.

$$2x^2 - 10 + 2x^6 - 5x^4 + 3x$$

Degree: \_\_\_\_\_

Leading Coefficient: \_\_\_\_\_

17. [5 points] Simplify  $(-8r^2 + 9r - 14) - 4(7r - 9r^2 - 6)$ .

18. [5 points] Multiply and simplify  $(5x + 3)(3x - 2)$ .

19. [5 points] Simplify. Express your answer with only positive exponents.

$$\frac{20a^7b^6c^8}{15b^9c^2}$$

20. [5 points] Divide. Write your answer in standard form,  $Q(x) + \frac{R}{2x}$ .

$$(6x^3 - 8x^2 - 10x + 5) \div (2x)$$



## Solutions

1. A rectangle has a length of 18 inches and an area of 72 square inches. Find the **width** and the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

$$\begin{aligned} \text{Area} &= \ell \times w \\ 72 &= 18w \\ \text{Width} &= \frac{72}{18} = 4 \text{ inches} && 2.5 \text{ pts; if missing units, deduct 0.5 pt.} \\ \text{Perimeter} &= 2(18 + 4) = 44 \text{ inches} && 2.5 \text{ pts; if missing units, deduct 0.5 pt.} \end{aligned}$$

2. Simplify  $-5[3x^2 - (8x^2 - 2y)]$ .

$$\begin{aligned} -5[3x^2 - 8x^2 + 2y] & \quad 2 \text{ pts to here} \\ -5[-5x^2 + 2y] & \quad 3 \text{ pts to here} \\ 25x^2 - 10y & \quad 5 \text{ pts to here} \end{aligned}$$

3. Solve for  $m$ . Simplify your answer.

$$32m + 28 - 12m = 10 - 14m$$

$$\begin{aligned} 20m + 28 &= 10 - 14m && 1 \text{ pt to here} \\ 20m + 14m &= 10 - 28 && 2 \text{ pts to here} \\ 34m &= -18 && 3 \text{ pts to here} \\ m &= -18/34 && 4 \text{ pts to here} \\ m &= -9/17 && 5 \text{ pts total} \end{aligned}$$

4. Solve the following equation for  $y$ .

$$\frac{1}{3}(y - 12) = \frac{1}{6}y + 4$$

$$\begin{aligned} \frac{1}{3}y - 4 &= \frac{1}{6}y + 4 && 1 \text{ pt to here} \\ 6\left(\frac{1}{3}y - 4\right) &= 6\left(\frac{1}{6}y + 4\right) && 2 \text{ pts to here} \\ 2y - 24 &= y + 24 && 3 \text{ pts to here} \\ y &= 48 && 4 \text{ pts total} \end{aligned}$$

5. Write the following verbal statement in algebraic form. “12 minus  $x$  equals two times the quantity of five minus two times  $x$ ”

$$12 - x = 2(5 - 2x) \quad 5 \text{ pts}$$

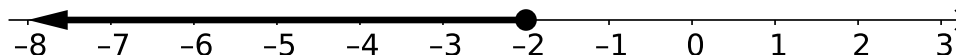
No partial credit.

6. The average weekday high temperature last week was  $83^\circ$ . The high temperatures on Monday through Thursday were  $75^\circ$ ,  $78^\circ$ ,  $84^\circ$ , and  $87^\circ$ . What was the high temperature on Friday?

$\frac{75+78+84+87+x}{5} = 83$	2 pts to here
$324 + x = 415$	3 pts to here
$x = 415 - 324 = 91$	4 pts to here
It was $91^\circ$ on Friday.	5 pts total

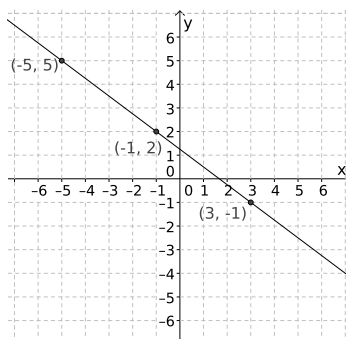
7. Solve and graph on the number line.

$$\frac{1}{3}x - 1 \geq \frac{5}{6}x$$



$\frac{6}{1} \left( \frac{1}{3}x - 1 \right) \geq \frac{6}{1} \left( \frac{5}{6}x \right)$	1 pt to here
$2x - 6 \geq 5x$	2 pts to here
$x \leq -2$ OR $-2 \geq x$	3 pts to here
add 2 pts for correct number line.	

8. Graph the line with a slope  $-\frac{3}{4}$  that passes through the point  $(-1, 2)$ . Be sure to label axes with  $x$ ,  $y$ , and with numbers. Identify at least three points on your line.



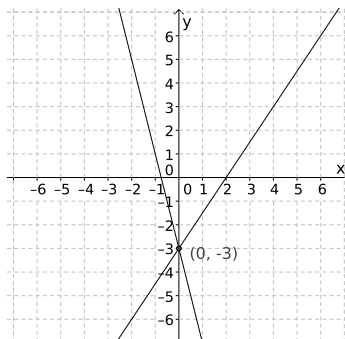
1 point for correct labeling of axes and numbers on them.
3 points for correctly identifying 3 pts.
1 pt for the correct line.

9. Find the equation of the line that passes through  $(-8, -7)$  and is perpendicular to the line  $y = 8x + 2$ .

Slope of the line $y = 8x + 2$ is 8	1 pt to here
Perpendicular slope: $m = -1/8$	2 pts to here
$-7 = -\frac{1}{8}(-8) + b$	3 pts to here
$-7 = 1 + b$ so $b = -8$	4 pts to here
$y = \frac{-1}{8}x - 8$	5 pts total

10. Solve by graphing the given system of equations. Be sure to label axes with  $x$ ,  $y$ , and with numbers. Identify and label the intersection point.

$$\begin{cases} 3x - 2y = 6 \\ 4x + y = -3 \end{cases}$$



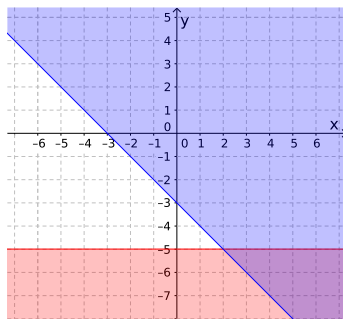
Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(0, -3)$	award 2 pts

11. On Wednesday, Gabriel picked up 10 cookies and 30 cups of hot cider for the office staff and paid a total of \$56.60. On Tuesday, Gabriel picked up 9 cookies and 18 cups of hot cider (from the same coffee shop) and paid a total of \$38.43. How much does the coffee shop charge for one cookie? How much do they charge for one cup of hot cider?

Let $x$ = the price of a cookie (in dollars)	
and $y$ = the price of a cup of hot cider (in dollars)	1 pt to here
$10x + 30y = 56.60$ and $9x + 18y = 38.43$	3 pts to here
$x = 1.49$ and $y = 1.39$	5 pts to here
One cookie costs \$1.49	
and one cup of hot cider costs \$1.39.	6 pts total

12. Graph the solution to the system of inequalities. Be sure to label the  $x$  and  $y$  axes.

$$\begin{cases} y \geq -x - 3 \\ y < -5 \end{cases}$$



1 pt for each correct line  
 1 pt for each correct shading  
 1 pt for the  $x$  and  $y$  axis labels (5 pts total)

13. Multiply and simplify your answer.

$$6x^3y^8z^4 \cdot 3x^7y^9z^{13} \cdot 5x^{10}$$

$90x^{20}y^{17}z^{17}$  1 pt for each variable with correct exponent  
 and 2 pts for the number 90

14. Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$$\frac{x^{-4}y^{-2}z^4}{z^{-5}}.$$

$\frac{z^5z^4}{x^4y^2}$  1 pt each for variables  $x$  and  $y$  (with positive exponent)

$\frac{z^9}{x^4y^2}$  2 pts for getting exponent of  $z$  correct  
 and 1 pt extra for getting it all correct.

15. (a) Write  $2.4 \times 10^{-5}$  in decimal notation.  
 (b) Write  $4.31 \times 10^6$  in decimal notation.

(a) 0.000024 2.5 pts  
 No partial credit.  
 (b) 4,310,000 2.5 pts  
 No partial credit.

16. Identify the degree and leading coefficient of the polynomial.

$$2x^2 - 10 + 2x^6 - 5x^4 + 3x$$

Degree: \_\_\_\_\_

Leading Coefficient: \_\_\_\_\_

Degree: 6 2.5 pts  
 Leading Coefficient: 2 2.5 pts  
 No partial credit.

17. Simplify  $(-8r^2 + 9r - 14) - 4(7r - 9r^2 - 6)$ .

$-8r^2 + 9r - 14 - 28r + 36r^2 + 24$  3 pts to here  
 $= 28r^2 - 19r + 10$  5 pts total

18. Multiply and simplify  $(5x + 3)(3x - 2)$ .

$15x^2 - 10x + 9x - 6$	3 pts to here
$15x^2 - x - 6$	5 pts total

19. Simplify. Express your answer with only positive exponents.

$$\frac{20a^7b^6c^8}{15b^9c^2}$$

$\frac{4a^7c^6}{3b^3}$	1 pt for each variable with correct exponent
	2 pts for the number $\frac{4}{3}$

20. Divide. Write your answer in standard form,  $Q(x) + \frac{R}{2x}$ .

$$(6x^3 - 8x^2 - 10x + 5) \div (2x)$$

$\frac{6x^3}{2x} - \frac{8x^2}{2x} - \frac{10x}{2x} + \frac{5}{2x}$	3 pts to here
$3x^2 - 4x - 5 + \frac{5}{2x}$	5 pts total