

NAME: _____ Score _____ /100
Please print

SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

2 points each for questions 1 – 25. 5 points each for questions 27 – 34. 10 pts for question 26.

Circle T or F, whichever is correct.

1. T **F** The graph of a linear inequality in two variables is a line.
2. **T** F The graph of an inequality of the form $|mx + b| < k$ is an interval on the number line.
3. T **F** The graph of an inequality of the form $|mx + b| > k$ is an interval on the number line.
4. T **F** The graph of an equality of the form $|mx + b| = k$ is an interval on the number line.
5. **T** F The graph of $y = 43$ (when considered in the plane) is a horizontal line.
6. **T** F The solution set for the equation $13x + 29y = 17$ is a set of ordered pairs of numbers.
7. T **F** The solution set for the equation $13x + 29y = 17$ is a set of numbers.
8. **T** F The graph of $13x + 29y < 17$ is a half-plane containing the origin.
9. T **F** A horizontal line has no slope.
10. T **F** The solution set for $|3x - 5| > -1$ is \emptyset .

Fill in each of the blanks to make the statements true. Remember what a formula is!

11. The inequality $|4x + 7| < 5$ is equivalent to the compact compound inequality **$-5 < 4x + 7 < 5$** .
12. The formula for the slope of a line through two points (x_1, y_1) and (x_2, y_2) is **$m = \frac{y_1 - y_2}{x_1 - x_2}$** .
13. The slope-intercept form of the equation of a line is **$y = mx + b$** .
14. The standard form for the equation of a line is **$Ax + By = C$** .
15. The point-slope form of the equation of a line is **$y - y_1 = m(x - x_1)$** .
16. Write $5x - 7y = 12$ in slope-intercept form **$y = \frac{5}{7}x - \frac{12}{7}$** .
17. Write $y = \frac{2}{3}x - \frac{4}{5}$ in standard form **$-10x + 15y = -12$ or $10x - 15y = 12$ or $y - \frac{2}{3}x = -\frac{4}{5}$ or $\frac{2}{3}x - y = \frac{4}{5}$** .
18. Write the slope of the graph of $y = -3x + 8$. **-3**
19. Write the y-intercept of the graph of $y = -3x + 8$. **8 or $(0, 8)$**
20. Write the x-intercept of the graph of $y = -3x + 8$. **$\frac{8}{3}$ or $(\frac{8}{3}, 0)$**

21. Write the x-intercept of $3x + 5y = 30$. **10 or (10, 0)**
22. Write the y-intercept of $3x + 5y = 30$. **6 or (0, 6)**
23. An **x-intercept** of a graph is a point where the graph intersects the x-axis.
24. A **y-intercept** of a graph is a point where the graph intersects the y-axis.
25. The graph of every **linear** equation in two variables is a non-vertical line.

26. (10 pts) Consider the inequality $5x - 4y > 20$. Answer the following questions about this inequality by filling in the blanks.

Solution:

Write the boundary equation. **$5x - 4y = 20$**

What is the x-intercept of the boundary line? **4 or (4, 0)**.

What is the y-intercept of the boundary line? **-5 or (0, -5)**.

Sketch the boundary line on Fig. 1. **Label important points.**

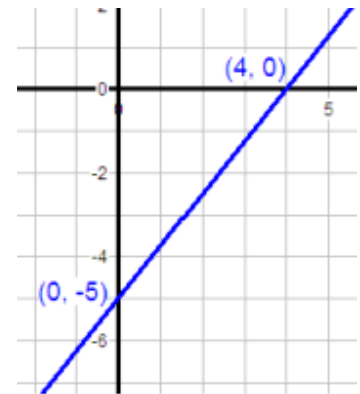


Fig. 1

Is (0, -5) an acceptable test point? **No**

Is the origin an acceptable test point? **Yes**

If the point (1, 1) is used as a test point we obtain $1 > 20$ which is a **false**

statement.

The half-plane containing the point (1, 1) is the graph of the inequality **$5x - 4y < 20$** .

The half-plane NOT containing the point (1, 1) is the graph of the inequality **$5x - 4y > 20$** .

Sketch the graph of $5x - 4y > 20$ on Fig 2. **Label important points.**

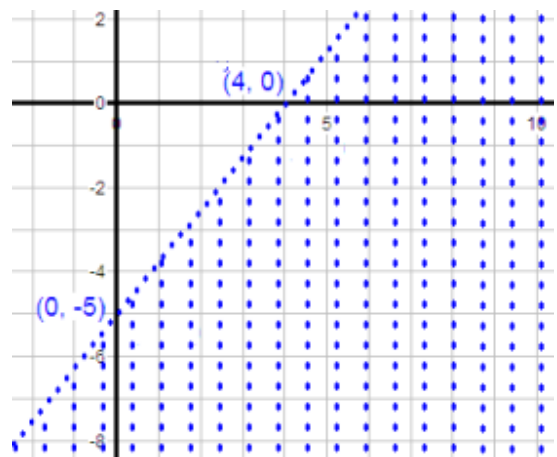


Fig. 2

Sketch the graph of $5x - 4y < 20$ on Fig 3. **Label important**

points.

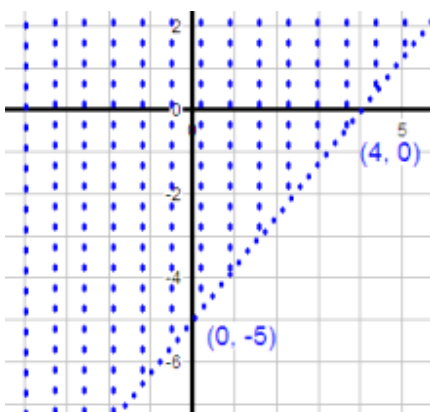


Fig. 3

27. To answer the questions in this problem you should assume

The solution set for $|ax + b| < k$ is A ,
the solution set for $|ax + b| > k$ is B ,
and the solution set for $|ax + b| = k$ is C .

- a) $A \cup B \cup C = \mathbf{R}$
- b) $A \cap B = \emptyset$
- c) A is an **interval** of the real number line.
- d) $A \cup B$ is all real numbers except those in C
- e) C is a set containing **two** elements.

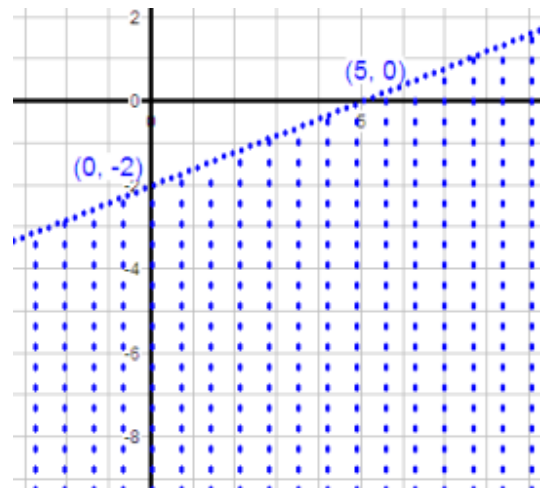
28. Sketch the graph of $2x - 5y > 10$. **Show your work and label important points.**

The boundary equation is $2x - 5y = 10$

If $x = 0$, then $y = -2$ which implies the y-intercept is $(0, -2)$

If $y = 0$, then $x = 5$ which implies the x-intercept is $(5, 0)$

Use $(0, 0)$ as a test point in $2x - 5y > 10$ to obtain $0 > 10$ which is false. Therefore the half-plane not containing the origin is the solution set for $2x - 5y > 10$. The solution set is shaded on the graph at the right.



29. Which of the following are linear equations in two variables. Indicate your answer by circling YES or NO.

- a) $2x - 4y = 7$ **(YES NO)**
- b) $|3x - 2y| = 5$ **(YES NO)**
- c) $2x + 3y = 12$ **(YES NO)**
- d) $x^2 + y^2 = 4$ **(YES NO)**
- e) $x + y < 2$ **(YES NO)**

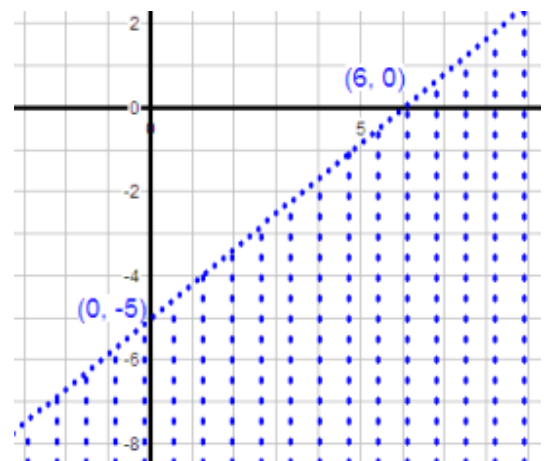
30. Consider the equation $5x - 6y = 30$.

If $x = 0$, then $y = -5$ and therefore the point $(0, -5)$ is the **y**-intercept.

If $y = 0$, then $x = 6$ and therefore the point $(6, 0)$ is the **x**-intercept.

If we use the origin $(0, 0)$ as a test point in the inequality $5x - 6y > 30$ we obtain $0 > 30$ which is ~~true~~ **false**
circle the correct word.

Sketch the graph of $5x - 6y = 30$ and $5x - 6y > 30$ on the coordinate system at the right.



Show your work on Exercises 31 – 34 inclusive. All your work and answers must be exact!
No work –No Credit **Be neat!**

31. Calculate the slope of the line through the points (3, 2) and (-5, 7). **Remember: If you intend to use a formula, state the formula and then use it. (Plan your work and work your plan).**

$$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{7 - 2}{-5 - 3} = \frac{5}{-8} = -\frac{5}{8}$$

32. Solve the inequality $|5x - 7| < 8$. **Begin by considering the inequality $|5x - 7| < 8$ which is equivalent to**

$$-8 < 5x - 7 < 8$$

$$-1 < 5x < 15$$

$$-\frac{1}{5} < x < 3$$

Therefore the solution set for $|5x - 7| < 8$ is $\left(-\frac{1}{5}, 3\right)$ whose endpoints are the solution for the boundary equation $|5x - 7| < 8$ and the remainder of the number line is the solution set for $|5x - 7| < 8$.

Therefore the desired solution set is $\left(-\infty, -\frac{1}{5}\right) \cup (3, +\infty)$

33. Find the equation of the line through the point (3, -1) with slope $\frac{2}{5}$. **Write the equation in slope intercept form.** **Remember: If you intend to use a formula, state the formula and then use it. (Plan your work and work your plan).**

form. **Remember: If you intend to use a formula, state the formula and then use it. (Plan your work and work your plan).**

Use the point-slope formula $y - y_1 = m(x - x_1)$

$$y + 1 = \frac{2}{5}(x - 3)$$

$$y + 1 = \frac{2x}{3} - \frac{6}{5}$$

$$y = \frac{2x}{3} - \frac{6}{5} - \frac{5}{5}$$

$$y = \frac{2}{3}x - \frac{11}{5}$$

34. Solve the inequality $\left|\frac{-2x - 1}{3}\right| < 2$. Write the solution set in interval notation.

$$\left|\frac{-2x - 1}{3}\right| < 2 \text{ is equivalent to}$$

$$-2 < \frac{-2x - 1}{3} < 2$$

$$-6 < -2x - 1 < 6$$

$$-5 < -2x < 7$$

$$\frac{5}{2} > x > -\frac{7}{2}$$

The solution set is $\left(-\frac{7}{2}, \frac{5}{2}\right)$