

NAME: \_\_\_\_\_ Score \_\_\_\_\_ /100  
Please print

SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

Circle T or F, whichever is correct. (2 pts each)

1. T **F** A point is on the x-axis if and only if its first coordinate y is zero.
2. T **F** The slope of a vertical line is 0.
3. **T** F A vertical line has no slope.
4. **T** F The graph of a linear inequality in two variables is a half-plane bounded by the graph of the corresponding boundary equation.
5. **T** F The boundary curve for a linear inequality in two variables is a line.
6. **T** F The equation for the vertical line through the point (0, k) is  $x = k$ .
7. **T** F To find the y-intercepts of a graph we let  $x = 0$  and solve for y.
8. T **F** If both sides of an inequality are multiplied by the same real number, the resulting inequality is equivalent to the original inequality.
9. **T** F The graph of an inequality consists of all the points, and only those points, whose coordinates satisfy the inequality.

Fill in each of the blanks to make the statements true. (2 pts each)

10. **Pythagorean Theorem:** If a and b are the lengths of the legs of a right triangle with hypotenuse of length c, then  $a^2 + b^2 = c^2$ .
11. The distance d between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by the formula:  

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}.$$
12. The midpoint of the line segment joining two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by the formula:  

$$\text{midpoint is } \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right).$$
13. The equation of a circle with radius r and center at the origin is  $x^2 + y^2 = r^2$ .
14. The equation of a circle with radius r and center at the point (h, k) is  $(x - h)^2 + (y - k)^2 = r^2$ .
15. A linear equation in two variables is an equation that can be written in the form  $y = mx + b$  where m and b are real numbers.

16. A linear inequality in two variables  $x$  and  $y$  is an inequality which can be written as

$$y < mx + b \text{ or } y > mx + b.$$

17. If the inequality symbol in an inequality in two variables is replaced with an equality symbol, the graph of the resulting equation is called the **boundary curve** for the inequality.

18. The slope of the line through two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by the formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$ .

19. The equation for the line through the point  $(x_1, y_1)$  with slope  $m$  is  $y - y_1 = m(x - x_1)$ . This is called the point-slope form.

20. Two non-vertical lines are perpendicular if their slopes are **negative reciprocals** of each other.

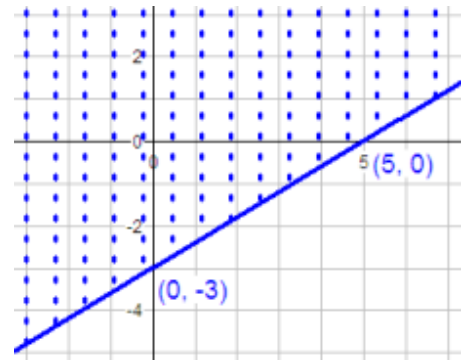
21. **(5 Points)** Consider the equation  $3x - 5y = 15$ .

If  $x = 0$ , then  $y = -3$  and therefore the point  $(0, -3)$  is the **y**-intercept.

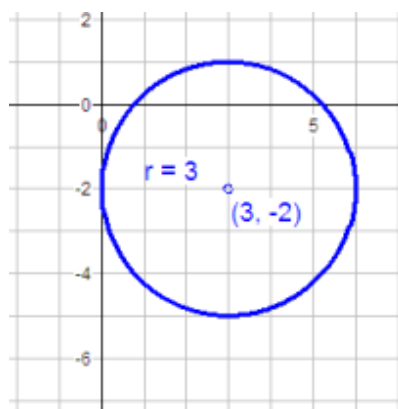
If  $y = 0$ , then  $x = 5$  and therefore the point  $(5, 0)$  is the **x**-intercept.

If we use the origin  $(0, 0)$  as a test point in the inequality  $3x - 5y < 15$  we obtain  $0 < 15$  which is **(true false)** circle the correct word.

Sketch the graph of  $3x - 5y = 15$  and  $3x - 5y < 15$  on the coordinate system at the right.



22. **(5 points)** Sketch the graph of the equation  $(x - 3)^2 + (y + 2)^2 = 9$ .



23. (5 points) Which of the following are linear equations in two variables. Indicate your answer by circling YES or NO.

a)  $2x - 4 = 7y$  (YES NO)

b)  $\frac{5x}{2} = 6y$  (YES NO)

c)  $2x + 3 = 12$  (YES NO)

d)  $\pi y + \sqrt{3} = \frac{15}{4}x - 2$  (YES NO)

e)  $x^2 - 2x + 7 = y$  (YES NO)

24. (10 points) Consider the inequality  $6x - 5y < 30$ . Answer the following questions about this inequality by filling in the blanks.

**Solution:**

Write the boundary equation  $6x - 5y = 30$ .

What is the x-intercept of the boundary line? (5, 0).

What is the y-intercept of the boundary line? (0, -6).

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

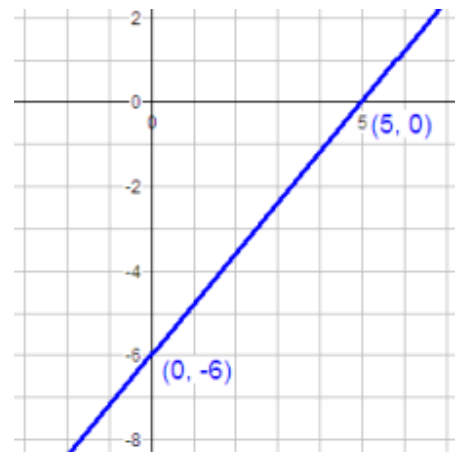


Fig. 1

Is (0, -6) 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  $1 < 30$  is a TRUE statement.

The half-plane containing the point (1, 1) is the graph of the inequality  $6x - 5y < 30$ .

The half-plane NOT containing the point (1, 1) is the graph of the inequality  $6x - 5y > 30$

Sketch the graph of  $6x - 5y < 30$  on Fig 2. Label important points.

Sketch the graph of  $6x - 5y > 30$  on Fig 3. Label important points.

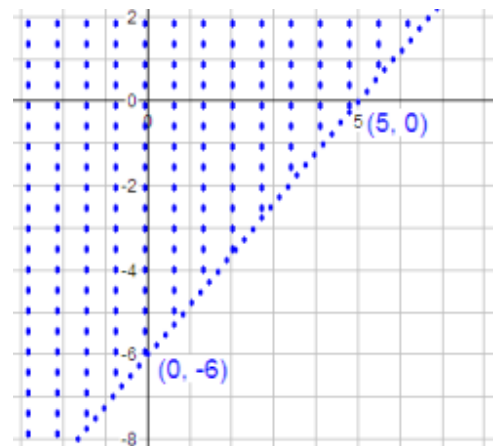


Fig. 2

which

of the

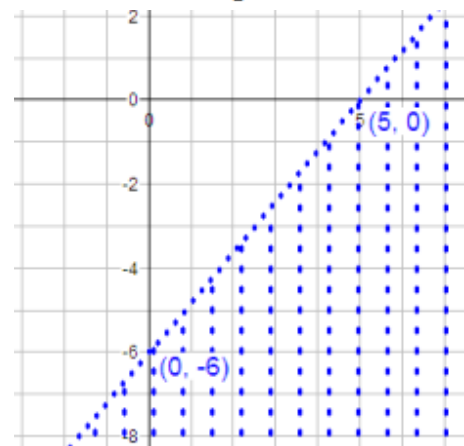


Fig. 3

25. **(5 points)** Find the equation of the line through (4, 2) with slope  $\frac{3}{5}$ . 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).**

Use  $y - y_1 = m(x - x_1)$  to obtain

$$y - 2 = \frac{3}{5}(x - 4) = \frac{3}{5}x - \frac{12}{5}$$

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

26. **(5 points)** Write the equation  $3x - 8y = 2y + 7x - 8$  in slope intercept form. **Be sure you show and explain important steps.**

$$3x - 8y = 2y + 7x - 8 \quad \text{Add } -2y \text{ } -3x \text{ to both sides}$$

$$-10y = 4x - 8 \quad \text{Multiply both sides by } -\frac{1}{10}$$

$$y = \frac{-4}{10}x + \frac{8}{10}$$

$$y = \frac{-2}{5}x + \frac{4}{5}$$

27. **(5 points)** Find the slope of the line through (2, -7) and (-4, -3). Write the slope in reduced form. **Remember: If you intend to use a formula, state the formula and then use it. (Plan your work and work your plan).**

Use  $m = \frac{y_1 - y_2}{x_1 - x_2}$  to obtain

$$m = \frac{-7 + 3}{2 + 4} = \frac{-4}{6} = -\frac{2}{3} \quad \text{or} \quad m = \frac{-3 + 7}{-4 - 2} = \frac{4}{-6} = -\frac{2}{3}$$

28. **(5 points)** Find the midpoint of the line segment joining the points (2, -7) and (-4, -3). **Remember: If you intend to use a formula, state the formula and then use it. (Plan your work and work your plan).**

Use midpoint is  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$  to obtain

$$\left(\frac{2 - 4}{2}, \frac{-7 - 3}{2}\right) = (-1, -5)$$

29. **(5 points)** Find the length of the line segment joining the points  $(2, -7)$  and  $(-4, -3)$ .

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

Use  $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$  to obtain

$$d = \sqrt{(2 - (-4))^2 + (-7 - (-3))^2} = \sqrt{6^2 + (-4)^2} = \sqrt{36 + 16} = \sqrt{52} = \sqrt{(4)(13)} = 2\sqrt{13}$$

30. **(5 points)** What are the x-intercepts of the equation  $y = (x - 3)(x + 1)(x - 7)$ ? **Be sure you show and explain important steps.**

To find the x-intercepts of an equation, we let  $y = 0$  and solve for  $x$ .

In this case that yields the equation  $0 = (x - 3)(x + 1)(x - 7)$ .

By the Zero Factor Property then  $x - 3 = 0$  or  $x + 1 = 0$  or  $x - 7 = 0$

Then it follows that  $x = 3$  or  $x = -1$  or  $x = 7$ .

The x-intercepts are  $(3, 0)$ ,  $(-1, 0)$ , and  $(7, 0)$ .

31. **(5 points)** Find the equation of the line whose graph is shown in Fig. 4 at the right. **Be sure you show and explain important steps.**

Clearly this line has slope  $-1$  and y-intercept  $3$ .

Therefore its equation is  $y = -x + 3$

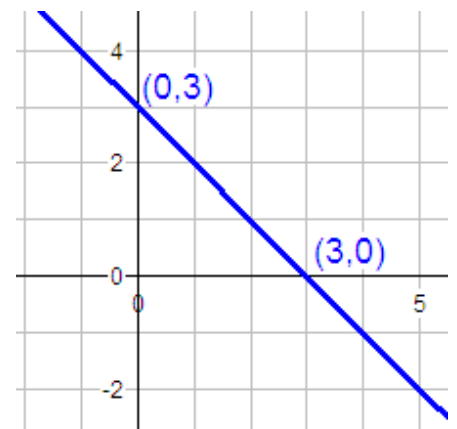


Fig. 4