

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 for 1 – 30. 5 pts. each for all others.

1. T **F** A solution of the equation  $x^5 + 3x^2 + 2x - 8 = 0$  is 1.
2. T **F**  $(3, 8] = \{x | x \in \mathbb{R} \text{ and } 3 < x < 8\}$
3. T **F** The graph of a quadratic equation in two variables can be a line.
4. **T** F The product of a complex number and its conjugate is a real number.
5. T **F**  $5x^3 - 3x^2 + 8x + 17$  is a mathematical equation.

Circle the symbol for the set of numbers if the number at the left is in the set of numbers. In each case you will circle more than one set.

The Symbols are standard: **C** is the complex numbers, **R** is the real numbers, **F** is the irrational numbers, **Q** is the rational numbers, **Z** is the integers, **W** is the whole numbers, and **N** is the natural numbers, and **P** is the prime numbers.

6. 3 is in **C R F Q Z W N P**
7.  $\frac{2}{5} - 7i$  is in **C R F Q Z W N P**
8.  $-\frac{7}{8}$  is in **C R F Q Z W N P**
9.  $\sqrt{7}$  is in **C R F Q Z W N P**
10.  $-43$  is in **C R F Q Z W N P**

Fill in each of the blanks to make the statements true.

11.  $(3,7]$  is an example of **interval** notation.
12. The exact circumference of a circle with radius 5 is  **$10\pi$** . Because  **$C = 2\pi r$** .
13. A linear equation in one variable is an equation which may be written in the form  **$ax + b = 0$** .
14. A quadratic equation in one variable is an equation which may be written in the form  **$ax^2 + bx + c = 0$** .
15. A quadratic equation in two variables is an equation which may be written in the form  **$y = ax^2 + bx + c$** .

Circle all the words which could be used to correctly complete the sentence.

16.  $2x - 7 = 0$  is a (linear quadratic identity conditional contradiction) equation.

17.  $x^4 + 1 = 0$  is a (linear quadratic identity conditional contradiction) equation.

18.  $x^2 + 5x + 6 = 0$  is a (linear quadratic identity conditional contradiction) equation.

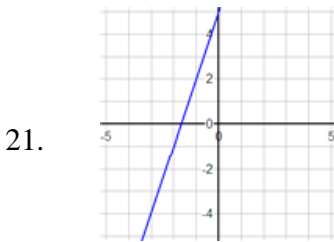
19.  $x^2 + 7 > 0$  is a (linear quadratic identity conditional contradiction) inequality.

20. If  $2x - 1 < 4$ , then  $-6x + 3 (<, =, >, \leq, \geq) -12$ .

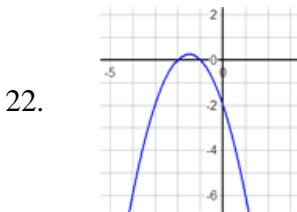
Match the following phrases with the graphs in problems 21 – 25 by writing the letter for the phrase in the blank.

- (a) linear equation in one variable
- (d) quadratic equation in one variable
- (g) linear inequality in one variable
- (k) quadratic inequality in one variable

- (b) linear equation in two variables with positive slope
- (c) linear equation in two variables with negative slope
- (e) quadratic equation in two variables with  $a > 0$
- (f) quadratic equation in two variables with  $a < 0$
- (h) linear inequality in two variables
- (p) quadratic inequality in two variables



Is the graph of **b**.



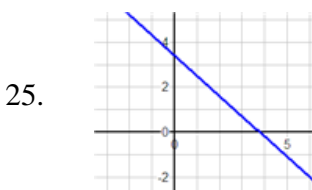
Is the graph of **f**.



Is the graph of **a**.



Is the graph of **k**.



Is the graph of **c**.

26. Write the equation of the circle with center at (h, k) and radius r.

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

27. Write the quadratic formula.

The solutions of a quadratic equation  $ax^2 + bx + c = 0$  are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

28. Write the multiplicative inverse of the complex number  $a + bi$ .

The multiplicative inverse of  $a + bi$  is its conjugate divided by its norm so it is:

$$\frac{a - bi}{a^2 + b^2}$$

29. Write the zero factor property.

If  $a$  and  $b$  are real numbers and  $ab = 0$ , then  $a = 0$  or  $b = 0$ .

30. Write the formula for the slope  $m$  of the line segment joining two points  $(x_1, y_1)$  and  $(x_2, y_2)$

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

31. Compute the product  $(3 + 2i)(1 - 5i)$ . Your answer should be written in standard form.

$$(3 + 2i)(1 - 5i) = 3 - 15i + 2i - 10i^2 = 3 - 13i + 10 = 13 - 13i = 13(1 - i)$$

32. The graph of a “less than” inequality is



a) Shade/sketch the graph of the boundary equation on this graph



b) Shade/sketch the graph of the “greater than” inequality on this graph



33. Use the Quadratic formula to solve the equation  $x^2 + x - 1 = 0$ . Show your work. no work: no credit

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-1 \pm \sqrt{1^2 - 4(1)(-1)}}{2(1)} = \frac{-1 \pm \sqrt{5}}{2}$$

34. A rectangular garden is 25 ft. wide. If its area is 1125 sq. ft., what is its length? Show your work. no work:no credit

Use the formula for area  $A = \ell w$  with  $A = 1125$  and  $w = 25$  to obtain  $1125 = 25 \ell$

Solve this equation for  $\ell$  to obtain  $\ell = 45$ .

The garden is 45 feet long.

35. Find the equation of the line through  $(3, -4)$  with slope  $\frac{2}{5}$ . Show your work. no work:no credit. Write your answer in slope-intercept form. **Two methods are presented.**

<p>Use the slope intercept equation for a line  <math>y - y_1 = m(x - x_1)</math>          To obtain <math>y - (-4) = \frac{2}{5}(x - 3)</math>  <math display="block">y + 4 = \frac{2}{5}x - \frac{6}{5}</math>  <math display="block">y = \frac{2}{5}x - \frac{6}{5} - 4 = \frac{2}{5}x - \frac{26}{5}</math></p>	<p>Use the slope-intercept form <math>y = mx + b</math> to obtain  <math>y = \frac{2}{5}x + b</math>          Because the point <math>(3, -4)</math> is on the graph  <math>-4 = \left(\frac{2}{5}\right)(3) + b</math>.          Solve this equation for <math>b</math> to obtain <math>b = -\frac{26}{5}</math>          From which it follows that the desired equation is <math>y = \frac{2}{5}x - \frac{26}{5}</math></p>
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36. Sketch the graph of  $y = 2x - 3$  Show your work. Label all important points. no work:no credit. Your work should show how you determined the important points.

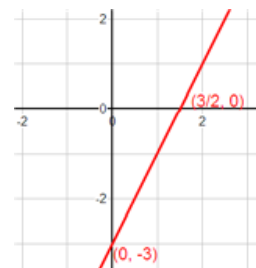
If  $x = 0$ , then  $y = -3$

Therefore the y-intercept is  $(0, -3)$ .

Or you can simply read the y-intercept from the slope-intercept form.

If  $y = 0$ , then  $2x - 3 = 0$  which may be solved for  $x = \frac{3}{2}$ .

Therefore the x-intercept is  $\left(\frac{3}{2}, 0\right)$



37. Sketch the graph of  $y = (x - 3)(x + 1)$  Show your work. Label all important points. no work:no credit

Your work should show how you determined the important points.

If  $y = 0$ , then  $0 = (x - 3)(x + 1)$

And by The Zero Factor Property

$x - 3 = 0$  OR  $x + 1 = 0$

$x = 3$  OR  $x = -1$

Therefore the x-intercepts are  $(3, 0)$  and  $(-1, 0)$ .

The first coordinate of the vertex is midway between these two x-intercepts.

Therefore the first coordinate of the vertex is 1.

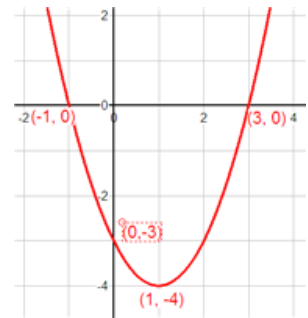
The first coordinate may also be computed by rewriting

$y = (x - 3)(x + 1) = x^2 - 2x - 3$  and then calculating  $\frac{-b}{2a} = \frac{-(-2)}{2(1)} = 1$ .

The second coordinate of the vertex is  $(1 - 3)(1 + 1) = -4$ .

The vertex is  $(1, -4)$

If  $x = 0$ , then  $y = -3$ . The y-intercept is  $(0, -3)$ .



38. A grocer mixes cashews that cost \$3.49 per pound and hazelnuts that cost \$4.52 per pound to make 100 pounds of a mixture that costs \$3.89 per pound. How much of each kind of nut is put into the mixture?

**Solution:**

Let  $x$  be the amount of cashews to be put into the mixture.

Then  $100 - x$  is the amount of hazelnuts put into the mixture.

The cost of the cashews in the mixture is  $3.49x$

The cost of the hazelnuts in the mixture is  $4.52(100 - x)$

The total cost contributed by the cashews and hazelnuts is  $3.49x + 4.52(100 - x)$ .

However, the total cost of the final mixture is required to be  $(3.89)(100) = 389$ .

This completes the analysis of the problem and we are now in a position to model the mixture problem with an equation.

**Write that equation. Do not solve the equation.**

Because two expressions represent the same quantity (total cost of the final mixture) they must be equal.

$$3.49x + 4.52(100 - x) = 389$$