

NAME: \_\_\_\_\_ Score \_\_\_\_\_/100

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SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

**Circle T or F, whichever is correct. 5 pts. each for 29 – 35. 2 pts for others unless otherwise labeled.**

1. T **F** An x-intercept of a graph is a point where the graph intersects the y-axis.
2. T **F** The point (0, 4) is on the x-axis.
3. **T** F The slope of a horizontal line is 0.
4. **T** F If a vertical line may be drawn so that it intersects a graph in more than one point, then that graph is not the graph of a function.
5. T **F** The first coordinate of the vertex of the graph of a quadratic function is  $\frac{b}{2a}$ .
6. T **F** The function  $f$  whose rule is  $f(x) = 3x + 5$  and the equation  $y = 3x + 5$  are equal.
7. T **F** The graph of a function is the set of all points of the form  $(f(a), a)$ .
8. T **F** The slope of a vertical line is 0.
9. **T** F The graph of the function  $f$  whose rule is  $f(x) = 3x + 5$  and the graph of the equation  $y = 3x + 5$  are the same.
10. **T** F The function whose rule is  $f(x) = x^2$  is the squaring function.

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

11. A quadratic function is a function whose rule may be written in the form  $f(x) = ax^2 + bx + c$  where  $a$ ,  $b$ , and  $c$  are real numbers and  $a$  is not zero.
12. The x-intercepts of any function are found by finding the real **zeros** of the function.
13. The function  $f$  whose rule is  $f(x) = 5$  is an example of a linear function but more specifically it is an example of a **constant** function.
14. The point  $(k, f(k))$  is on the graph of the function  $f$ . If  $f(k) > 0$ , the point is **above** the x-axis.
15. If the rule for a function is  $f(x) = x^3 - x + 5$ , the range element associated with the domain element 2 is **11**.
16. A zero of a function  $f$  is a domain element  $k$  for which  **$f(k) = 0$** .
17. The midpoint of the line segment joining  $(3, 5)$  and  $(-4, 9)$  is.

$$m = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left( \frac{3 + (-4)}{2}, \frac{5 + 9}{2} \right) = \left( -\frac{1}{2}, \frac{14}{2} \right) = \left( -\frac{1}{2}, 7 \right)$$

18. The exact length of the line segment joining  $(3, 5)$  and  $(-4, 9)$  is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} = \sqrt{(3 - (-4))^2 + (5 - 9)^2} = \sqrt{49 + 16} = \sqrt{65}$$

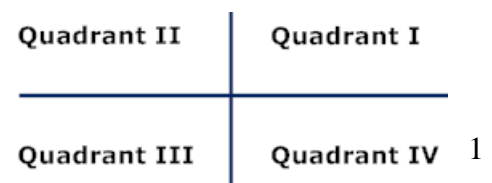
19. Write the equation of the circle with center  $(3, 5)$  and radius  $\sqrt{11}$ .

Use  $(x - h)^2 + (y - k)^2 = r^2$  to obtain  $(x - 3)^2 + (y - 5)^2 = 11$ .

20. The graph of the function whose rule is  $f(x) = \frac{\sqrt{7}}{3}x - \frac{11}{15}$  is a **line**.

**Questions 20– 25 are about the Cartesian coordinate system.**

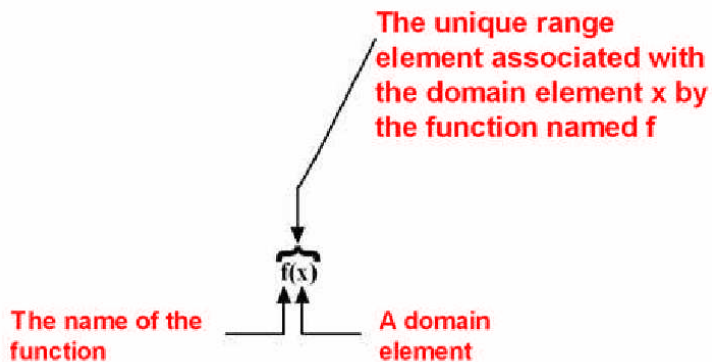
21. A rectangular coordinate system (Cartesian coordinate system) consists of two perpendicular number lines. One number line is drawn **horizontally** and the other is drawn **vertically**.
22. The point where these number lines intersect is the **0** point on each number line.
23. The horizontal number line is usually called the **x-axis**.
24. The vertical number line is usually called the **y-axis**.
25. The point of intersection of the two number lines is called the **origin** of the coordinate system.
26. Label the quadrants on the coordinate system.



27.(6 pts) A **function** consists of three things;

- A set called the **domain**
- A set called the **range**
- A **rule** which associates **each** element of the **domain** with a **unique** element of the range.

28. (4 pts) .



Questions 29 – 32 are about the same function.

29. Find the vertex of the graph of the function whose rule is  $f(x) = x^2 + 2x - 3$ .

The vertex is  $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right) = \left(-\frac{2}{2}, f\left(-\frac{2}{2}\right)\right) = (-1, f(-1)) = (-1, -4)$

Note :  $f(-1) = (-1)^2 + 2(-1) - 3 = 1 - 2 - 3 = -4$

30. What are the x-intercepts of the function whose rule is  $f(x) = x^2 + 2x - 3$ ?

The x-intercepts of  $f$  are the real zeros of  $f$ .

The zeros of  $f$  are found by solving the equation resulting from  $f(x) = 0$ .

Therefore we must solve the equation  $x^2 + 2x - 3 = 0$

$(x + 3)(x - 1) = 0$

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

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

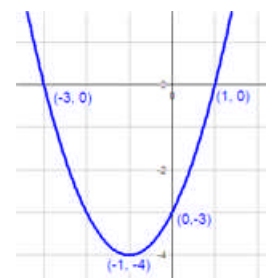
The x-intercepts are  $(-3, 0)$  and  $(1, 0)$

31. What are the y-intercepts of the function whose rule is  $f(x) = x^2 + 2x - 3$ ?

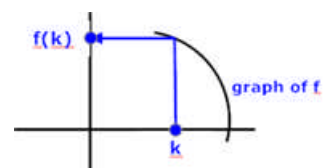
The y-intercept occurs when  $x = 0$ .  $f(0) = -3$ .

The y-intercept is  $(0, -3)$

32. Use your answers in #29 - #31 to sketch the graph of the function whose rule is  $f(x) = x^2 + 2x - 3$ . Label all important points.



33. Draw an arrow from the domain element  $k$  to its corresponding range element  $f(k)$ . Place a dot at  $f(k)$  and label it  $f(k)$ .



34. Find the equation of the line through (3, 5) and (-4, 9). Write the equation in slope-intercept form.

$$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{9 - 5}{-4 - 3} = -\frac{4}{7}. \text{ Then use the point slope formula}$$

$y - y_1 = m(x - x_1)$ ,  $m = -\frac{4}{7}$ , and (3,5) to obtain

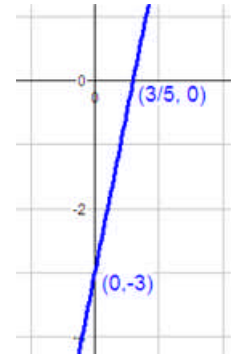
$$y - 5 = -\frac{4}{7}(x - 3)$$

$$y - 5 = -\frac{4}{7}x + \frac{12}{7}$$

$$y = -\frac{4}{7}x + \frac{12}{7} + 5$$

$$y = -\frac{4}{7}x + \frac{12}{7} + \frac{35}{7}$$

$$y = -\frac{4}{7}x + \frac{47}{7}$$



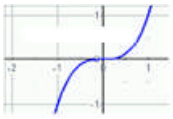
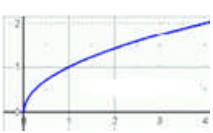
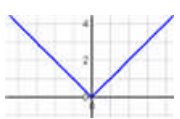
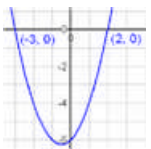

35. Sketch the graph of the function whose rule is  $f(x) = 5x - 3$ . Label the intercepts.

The y-intercept is (0, -3)

The x-intercept is found by solving  $5x - 3 = 0$

So the x-intercept is  $(3/5, 0)$

(2 pts each) For Questions 35 – 39, you are to classify the function whose graph is shown by writing one of the following classifications in the blank: constant function, zero function, identity function, cube root function, cubing function, square root function, absolute value function, squaring function, quadratic function, reciprocal function.

|  |  |   |
|--|--|---|
| <p>36.</p>  <p>Cubing function</p>    | <p>37.</p>  <p>Square root function</p> | <p>38.</p>  <p>Absolute Value function</p> |
| <p>39.</p>  <p>Quadratic function</p> | <p>40.</p>  <p>Identity function</p>    |   |