

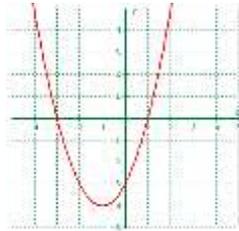
Practice Problems for MTE 9 – Functions, Quadratic Equations, and Parabolas

1. Of the following relations, circle those that represent functions:

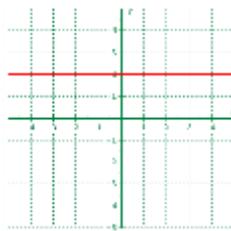
- (a) $x = y^2$
- (b) $y = x^2$
- (c) $\{(1,1), (1,2)\}$
- (d) $\{(1,1), (2,1)\}$
- (e) $x = |y|$

2. Of the following relations, circle those that represent functions:

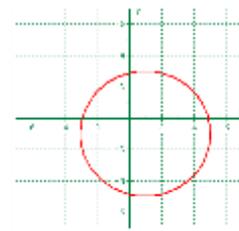
a.



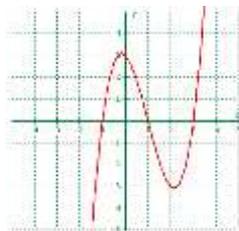
b.



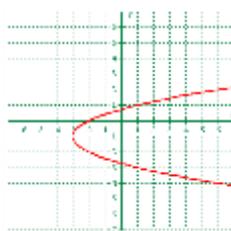
c.



d.



e.



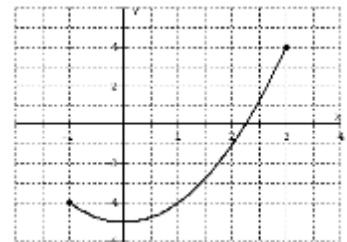
3. State the domain of the function defined by the set of ordered pairs.

$$\{(-3,2), (-1,0), (4,5), (7,-8)\}$$

4. State the range of the function defined by the set of ordered pairs.

$$\{(-3,2), (-1,0), (4,5), (7,-8)\}$$

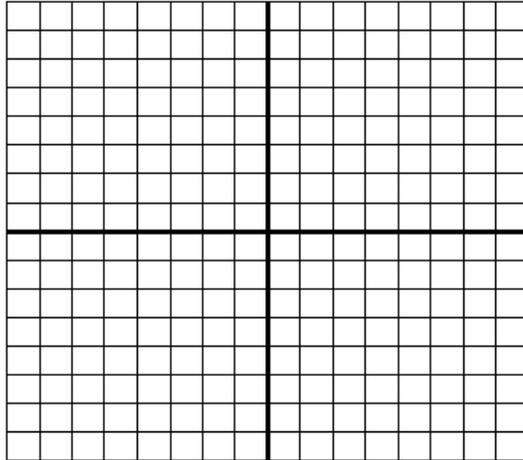
5. State the domain and range of the function defined by the graph.



6. State the domain of the function $f(x) = \sqrt{x-1}$

7. State the domain of the function $f(x) = \frac{x-1}{x+2}$

8. Given $f(x) = 3 - 2x - x^2$ evaluate $f(-1)$.
9. For the function $f(x) = x^2 - 1$ evaluate $f(a)$.
10. For the function $f(x) = 3x^2 - 2x + 4$ evaluate $f(x + h)$.
11. Find the roots of $2x^2 - 4 = 0$.
12. Find the roots of $3x^2 + x - 2 = 0$.
13. Find the roots of $x^2 - x - 1 = 0$.
14. Find the roots of $x^2 - 4x + 4 = 0$.
15. Find the roots of $x^2 + 4x + 6 = 0$.
16. Describe the roots of a quadratic function by matching the following where $D = b^2 - 4ac$ is the discriminant of the quadratic formula:
 - (a) $D > 0$ and is not a perfect square _____ (I.) The quadratic has no real roots.
 - (b) D is a perfect square _____ (II.) The vertex of the graph of the quadratic function is on the x-axis.
 - (c) $D = 0$ _____ (III.) The quadratic can be factored.
 - (d) $D < 0$ _____ (IV.) The quadratic has two distinct irrational roots.
17. Write $f(x) = x^2 + 6x + 6$ in vertex form and indicate the coordinates of the vertex.
18. Write $f(x) = 2x^2 + 4x + 1$ in vertex form and indicate the coordinates of the vertex.
19. Identify the vertex of $f(x) = 2x^2 + 12x + 17$ by using the formula method.
For questions 20 through 26 you are given $f(x) = x^2 - 6x + 8$.
20. Does the graph representing this equation open upward or downward? How do you know?
21. Determine the vertex of the parabola by putting the equation in vertex form.
22. Determine the axis of symmetry of the parabola.
23. Determine the x -intercepts of the parabola.
24. Determine the y -intercept of the parabola.
25. Determine the points on the parabola when $x = 1$ and when $x = -1$.
26. On the grid given, make a sketch of the parabola. Be sure to indicate the vertex, axis of symmetry, x -intercepts, and y -intercept. Label the graph appropriately.



27. A rectangular-shaped vegetable garden next to a barn is to be fenced on three sides with 120 total feet of fencing. Find the dimensions of the garden that will maximize the area.



28. If the revenue function for a market gardener growing a crop of tomatoes is given by $R(x) = -x^2 + 50x$ where x is the number of bushels grown, what is the maximum revenue possible? How many bushels are sold to yield this maximum revenue?
29. A flare is fired directly upward into the air from a boat that is experiencing engine problems. The height of the flare (in feet) above the water, t seconds after being fired is given by the model $h(t) = -16t^2 + 96t + 5$. If the flare is designed to explode when it reaches its highest point, at what height will this occur? How many seconds after the flare is fired does it explode?
30. Can a function have two y -intercepts? Explain your answer.
31. Is it possible for the range of a quadratic function to equal all real numbers? Explain your answer.