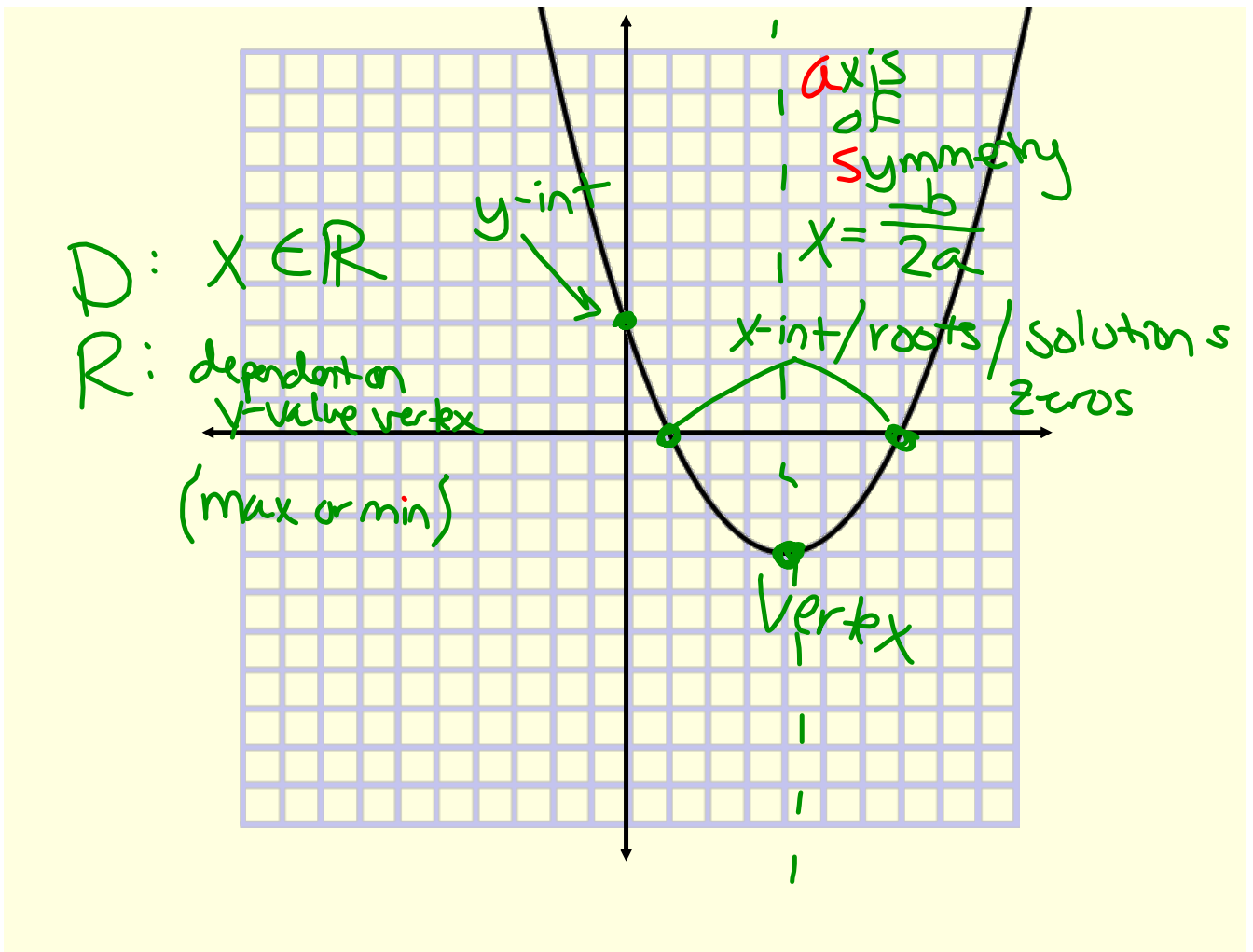


Parabolic paths are found in many real-life situations.

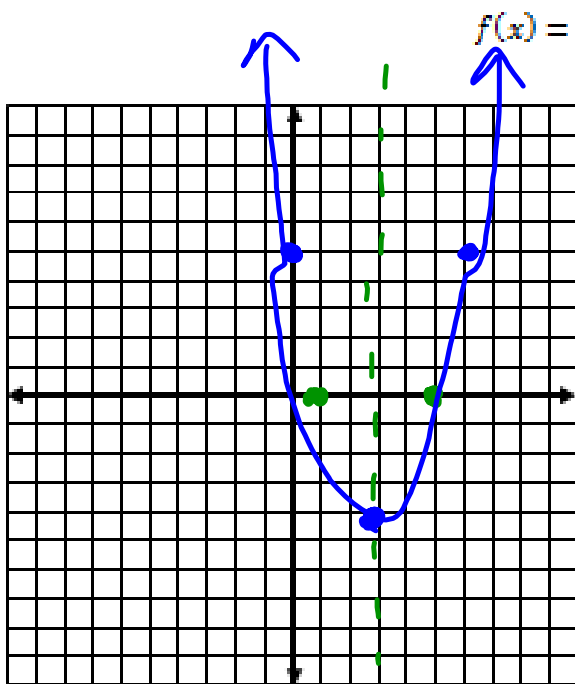
We model this shape using quadratic functions.





$$F(x) = a(x-p)(x-q)$$

For the following quadratic functions, find the vertex, axis of symmetry, x and y-intercepts, domain and range. Accurately sketch each function.



$$y = (0-5)(0-1) \quad (0, 5)$$

y-intercept (where  $x = 0$ ):

$$0 = (x-5)(x-1) \quad (5, 0) \quad (1, 0)$$

x-intercepts (where  $y = 0$ ):

vertex:  $\{3, -4\}$

axis of symmetry:  $x = 3$

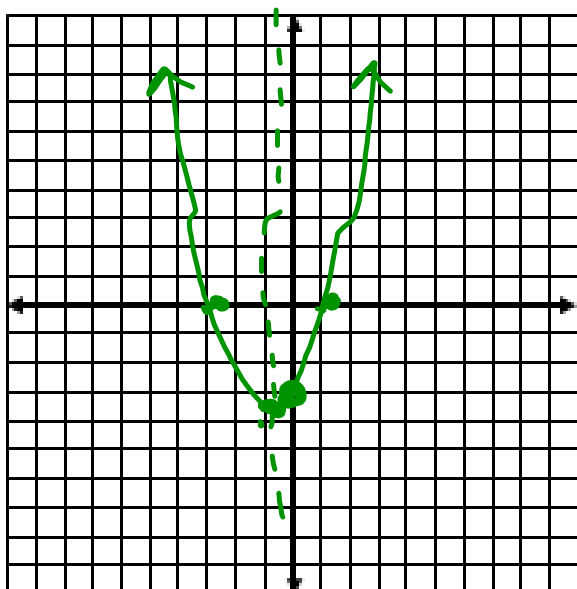
domain:  $x \in \mathbb{R}$

range:  $y \geq -4$

$$f(x) = ax^2 + bx + c$$

For the following quadratic functions, find the vertex, axis of symmetry, x and y-intercepts, domain and range. Accurately sketch each function.

$$f(x) = x^2 + x - 3$$



$$f(0) = 0^2 + 0 - 3$$

y-intercept (where  $x = 0$ ):  $(0, -3)$

$$0 = x^2 + x - 3 \quad (-2.3, 0) \quad (1.3, 0)$$

x-intercepts (where  $y = 0$ ):

$$f(-\frac{1}{2}) = (-\frac{1}{2}, -\frac{13}{4})$$

vertex:

$$x = -\frac{b}{2a} \quad x = -\frac{1}{2}$$

axis of symmetry:

$$\text{domain: } x \in \mathbb{R}$$

range:

$$y \geq -3.25$$

Vertex form:  $f(x) = a(x-h)^2 + k$

For the following quadratic functions, find the vertex, axis of symmetry, x and y-intercepts, domain and range. Accurately sketch each function.

$$f(x) = -(x-3)^2 - 1$$

$$f(0) = -(0-3)^2 - 1$$

y-intercept (where  $x = 0$ ):  $(0, -10)$

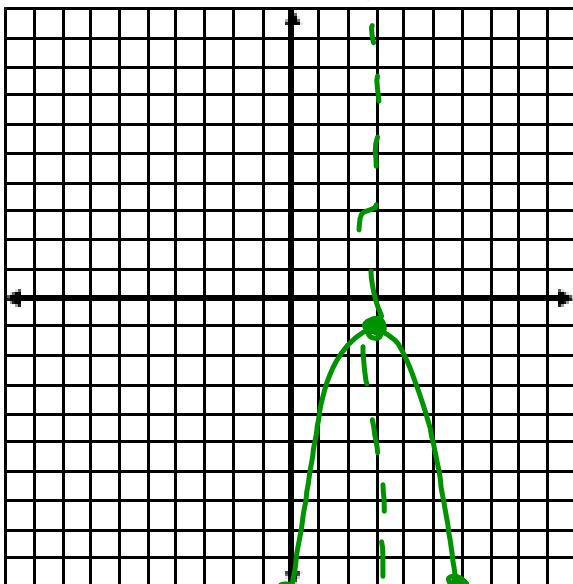
x-intercepts (where  $y = 0$ ): none

vertex:  $(3, -1)$

axis of symmetry:  $x = 3$

domain:  $x \in \mathbb{R}$

range:  $y \leq -1$



$(h, k)$  is vertex!

Key summary ideas about quadratic functions:

The vertex can be a minimum or a maximum.

The axis of symmetry is a line that passes through vertex

The axis of symmetry is always written in the form  $x = ?$ .

The vertex is the midpoint of the x-intercepts

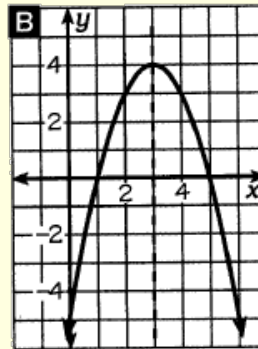
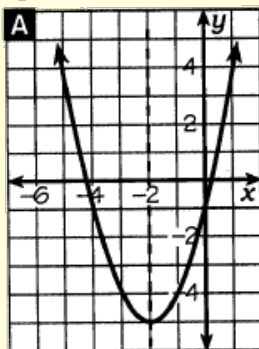
The domain is always  $x \in \mathbb{R}$ .

The range is bounded by the y-value of the vertex

In Exercises 1-4, use the graphs at the right to find the following:

B  
F  
D  
G

- 1 The equation of the axis of symmetry for Graph A.
- 2 The coordinates of the vertex for Graph A.
- 3 The equation of the axis of symmetry for Graph B.
- 4 The coordinates of the vertex for Graph B.



Answers 1-4

- F  $x = 0$
- ~~D  $x = 3$~~
- ~~D  $x = -2$~~
- Y  $(3, 3)$
- ~~F  $(-2, -5)$~~
- V  $(-2, -3)$
- ~~G  $(3, 4)$~~

In Exercises 13-16, use the vertical motion formula given in the box below.

If an object is thrown upward, its approximate height  $h$  (in feet) is given by the formula:  $h = -16t^2 + vt + c$ , where  $t$  is the time in motion (in seconds),  $v$  is the initial upward velocity (in feet per second), and  $c$  is the initial height (in feet).

Zen throws a ball upward with an initial upward velocity of 64 ft/s. The ball is 5 ft above the ground when it leaves Zen's hand. **K**

- 13 In how many seconds will the ball reach its maximum height?
- 14 What is the ball's maximum height? **L**

A fireworks rocket is shot upward with an initial velocity of 80 ft/s. The rocket is 3 ft above the ground when it is fired. **A**

- 15 In how many seconds will the rocket reach its maximum height?
- 16 What is the rocket's maximum height? **S**

Answers 13-16

- A 2.5 sec
- K 2 sec
- T 2.8 sec
- O 88 ft
- L 69 ft
- S 103 ft

16	11	6	14	14	2	12	4	8	2	16	12	15	10	6	1	15	5	13	9	15	7	3	16
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## Homework Assignment:

pg.154 (1-5 all)

pg.155 (1-11 all)

pg.156 (1-7 odd) with accurate  
graphs