

Solve the following equations by:

a) factoring

b) completing the square

c) quadratic formula

1. $x^2 + 5x + 6 = 0$

$$(x+2)(x+3)=0$$

$$x = -2, -3$$

2. $2x^2 + x - 6 = 0$

$$(2x+3)(x-2)=0$$

$$x = -3/2, 2$$

3. $2x^2 - 4x = 16$

$$2x^2 - 4x - 16 = 0$$

$$2(x^2 - 2x - 8) = 0$$

$$2(x-4)(x+2) = 0$$

$$x = 4, -2$$

4. $y = -3(x+1)^2 + 10$

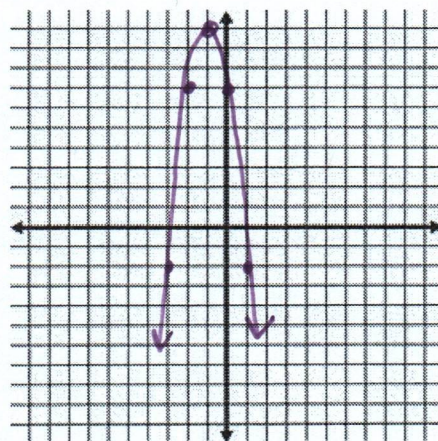
a) Graph

b) vertex: $(-1, 10)$

c) axis of symmetry: $x = -1$

d) x-intercept(s): (find exact value, check on calculator)

$$\left(-1 \pm \frac{\sqrt{30}}{3}, 0\right)$$



e) y-intercept: $(0, 7)$

f) domain: \mathbb{R}

g) range: $(-\infty, 10]$

h) Intervals of increase and decrease: increase $(-\infty, -1]$
decrease $[-1, \infty)$

i) End behavior:

$$\begin{array}{ll} x \rightarrow -\infty & y \rightarrow -\infty \\ x \rightarrow \infty & y \rightarrow -\infty \end{array}$$

5. $y = -2(x-2)^2 + 1$

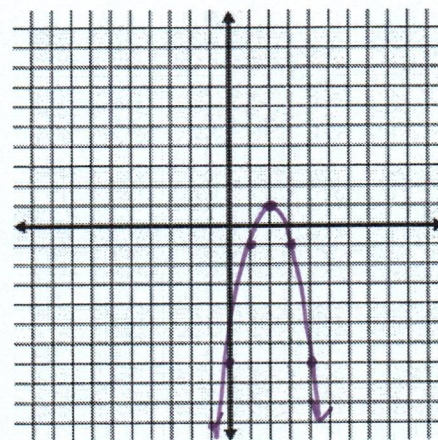
a) Graph

b) vertex: $(2, 1)$

c) axis of symmetry: $x = 2$

d) x-intercept(s): (find exact value, check on calculator)

$$\left(2 \pm \frac{\sqrt{2}}{2}, 0\right)$$



e) y-intercept: $(0, -7)$

f) domain: \mathbb{R}

g) range: $(-\infty, 1]$

h) Intervals of increase and decrease: increase: $(-\infty, 2]$
decrease: $[2, \infty)$

i) End behavior:

$$\begin{array}{ll} x \rightarrow -\infty & y \rightarrow -\infty \\ x \rightarrow \infty & y \rightarrow -\infty \end{array}$$

6. $y = -3x^2 - 12x - 5$

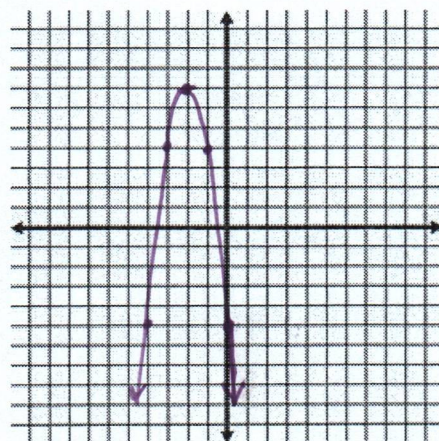
a) Graph

b) vertex: $(-2, 7)$

c) axis of symmetry: $x = -2$

d) x-intercept(s): (find exact value, check on calculator)

$$\left(\frac{-6 \pm \sqrt{21}}{3}, 0 \right)$$



e) y-intercept: $(0, -5)$

f) domain: \mathbb{R}

g) range: $(-\infty, 7]$

h) Intervals of increase and decrease: increase: $(-\infty, -2]$
decrease: $[-2, \infty)$

i) End behavior:

$$x \rightarrow -\infty \quad f(x) \rightarrow -\infty$$

$$x \rightarrow \infty \quad f(x) \rightarrow -\infty$$

7. The function $y = -\frac{1}{16}(x - 8)^2 + 4$ models the jump of a kangaroo in feet.

A) What is the kangaroo's maximum height?

$$4 \text{ ft}$$

B) How long is the kangaroo's jump?

$$16 \text{ ft}$$



8. Some harbor police departments have fire-fighting boats with water cannons. The boats are used to fight fires that occur within the harbor.

The function $y = -0.0035(x - 0)(x - 143.9)$ models the path of the water shot by a water cannon in feet.

A) How far does a water cannon shoot?

$$143.9 \text{ ft}$$

B) What is the maximum height of the water?

$$18.12 \text{ ft}$$



9. The length of a rectangle is three more than twice the width. Determine the dimensions that will give a total area of 27m^2 .

3m

10. We are going to fence in a rectangular field and we know that for some reason we want the field to have an enclosed area of 75ft^2 . We also know that we want the width of the field to be 3 feet longer than the length of the field. What are the dimensions of the field?

7.29 ft x 10.29 ft

11. A flare is launched from a boat. The height, h , in meters, of the flare above the water is approximately modeled by the function $h(t) = -15t^2 + 150t$, where t is the number of seconds after the flare is launched. How many seconds will it take for the flare to hit the water?

$t = 10$ seconds

12. A jump in inches on a pogo stick with a bow spring can be modeled by the following equation: $y = -\frac{7}{6}(x - 6)^2 + 42$

A) What is the maximum jump height in inches? 42 in.

B) How far does the pogo stick go in the horizontal direction? 12 in.

