Key

Algebra II Academic
Chapter 5 Study Guide
(Sections 5.1-5.4, 5.6)

Name _____
Date _____ Period _____

In #1-6, factor the following expressions completely.

1) $x^2-13x-30$

$(x-15)(x+2)$

2) $(7yx-35y)+(4qx-20q)$

$7y(x-5)+4q(x-5)$

$(7y+4q)(x-5)$

3) $100x^2-36$

$4(25x^2-9)$

$4(5x+3)(5x-3)$

4) $6x^2+7x-10$

P(-60) | S(7)
12, -5 | ✓

$(6x^2+12x)(-5x-10)$

$6x(x+2)-5(x+2)$

$(6x-5)(x+2)$

5) $6x^3+46x^2+60x$

$2x(3x^2+23x+30)$

P(90) | S(23)
18, 5 | ✓

$(3x^2+18x)(5x+30)$

$3x(x+6)+5(x+6)$

$2x(3x+5)(x+6)$

6) $27t^3-1$

$a=3t$, $b=1$

$(3t)^3-(1)^3$

$(3t-1)\left[(3t)^2+(3t)(1)+(1)^2\right]$

$(3t-1)(9t^2+3t+1)$

In #7-12, find the solutions (roots, zeros, x-intercepts) for each quadratic equation. Round to the thousandths place if necessary.

7) $x^2=13x+30$ (factorable)

$x^2-13x-30=0$

$(x-15)(x+2)=0$

$x-15=0$ | $x+2=0$
$+15\ +15$ | $-2\ -2$
$x=15$ | $x=-2$

8) $10.-7x^2=-102$ (No b-value → square root)

$-10\quad -10$

$\frac{-7x^2}{-7}=\frac{-112}{-7}$

$\sqrt{x^2}=\sqrt{16}$

$x=\pm\sqrt{16}$

$x=\pm 4$

9) $5x^2-17x-10=0$ (not factorable)

$a=5$, $b=-17$, $c=-10$

$x=\frac{17\pm\sqrt{(-17)^2-4(5)(-10)}}{2(5)}$

$x=\frac{17\pm\sqrt{489}}{10}$

$x=\frac{17+\sqrt{489}}{10}$ $x=3.911$

$x=\frac{17-\sqrt{489}}{10}$ $x=-.511$

10) $6x^2-10=11x$ (not factorable)

$6x^2-11x-10=0$

$a=6$, $b=-11$, $c=-10$

$x=\frac{11\pm\sqrt{(-11)^2-4(6)(-10)}}{2(6)}$

$x=\frac{11\pm\sqrt{361}}{12}$

$x=\frac{11\pm 19}{12}$

$x=\frac{11+19}{12}$ $x=2.5$

$x=\frac{11-19}{12}$ $x=-2/3$

11) $7x^2 - 23 = 5$ (No b-value → square root)

$+23 \quad +23$

$\frac{7x^2}{7} = \frac{28}{7}$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm\sqrt{4}$

$x = \pm 2$

12) $9x^2 - 6x + 1 = 0$ (factorable)

P(9) | S(-6)

-3, -3 | ✓

$(9x^2 - 3x)(-3x + 1) = 0$

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

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

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

$3x - 1 = 0$

$+1 \quad +1$

$\frac{3x}{3} = \frac{1}{3}$

$x = 1/3$

13) Find the discriminant of the following quadratic equation, state the number of real solutions, and sketch a possible graph.

$b^2 - 4ac$

$-5x^2 - 5x + 4 = -6$

$+5x^2 + 5x - 4 \quad -4 \quad +5x^2 + 5x$

$5x^2 + 5x - 10 = 0$

$a = 5$

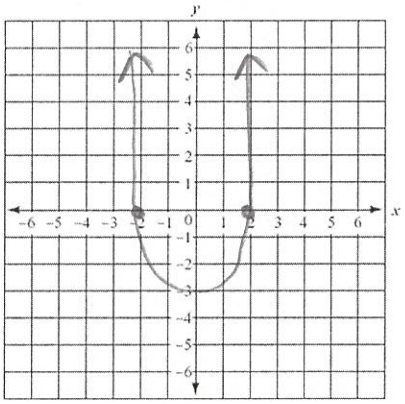
$b = 5$

$c = -10$

$(5)^2 - 4(5)(-10) = 225$

Discriminant → 225

# of solutions → 2 real roots



In #14-15, graph the quadratic function.

14) Sketch a graph of the following quadratic function: $y = -(x-1)^2 + 1$

Open Up or Down: Down

Max or Min: max

Vertex: (1, 1)

Axis of Symmetry: $x = 1$

Domain: $(-\infty, \infty)$ Range: $(-\infty, 1]$

X-Intercepts:

(0,0) (2,0)

$0 = -(x-1)^2 + 1$

$-1 \quad\quad -1$

$\frac{-1}{-1} = \frac{-(x-1)^2}{-1}$ → $\sqrt{1} = \sqrt{(x-1)^2}$ → $\pm\sqrt{1} = x - 1$

$\pm 1 = x - 1$

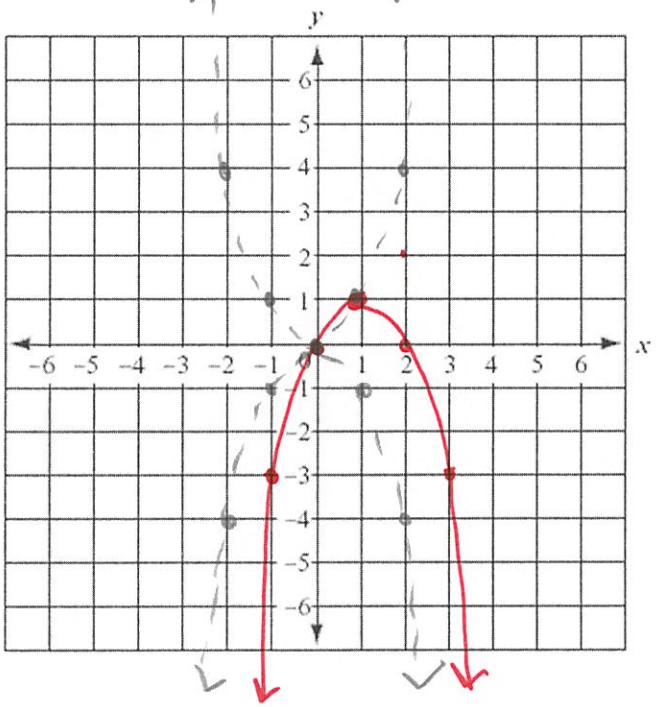
$+1 \quad +1$

$2 = x$

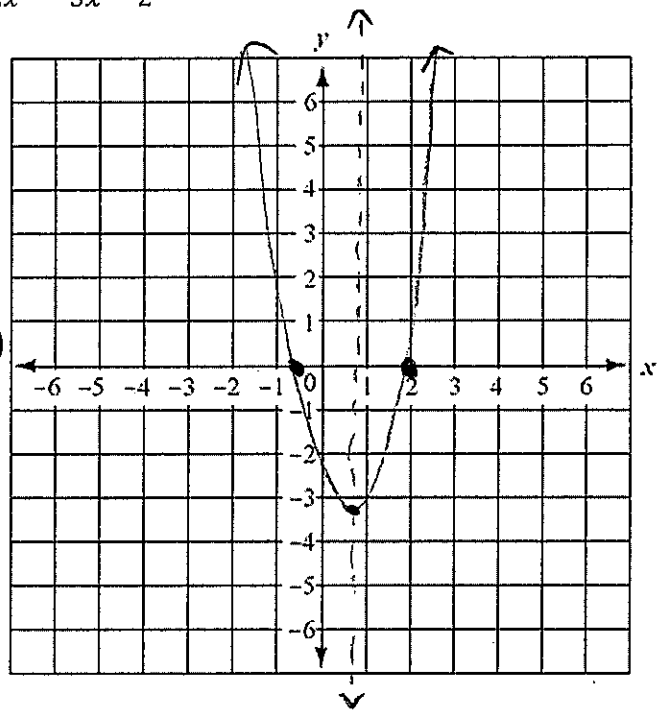
$-1 = x - 1$

$+1 \quad +1$

$x = 0$



15) Sketch a graph of the following quadratic function: $y = 2x^2 - 3x - 2$



Open Up or Down: UP

Max or Min: min

Vertex: (.75, -3.125) $a=2, b=-3, c=-2$

$x = \frac{-b}{2a}$ $x = \frac{3}{2(2)}$ $x = 3/4$ (.75) $y = 2(3/4)^2 - 3(3/4) - 2$ $y = -25/8$ (-3.125)

Axis of Symmetry: $x = .75$

Domain: $(-\infty, \infty)$ Range: $[-3.125, \infty)$

X-Intercepts:

(-1/2, 0) (2, 0)

P(-4) | S(-3) ✓
-4, 1

$(2x^2 - 4x)(x - 2)$
$2x(x-2) + 1(x-2)$
$(2x+1)(x-2)$

$2x+1 = 0$ | $x-2 = 0$
$-1 \quad -1$ | $+2 \quad +2$
$\frac{2x}{2} = \frac{-1}{2}$ | $x = 2$
$x = -1/2$

16) A rocket is launched from ground level with an initial velocity of 192 ft/sec. The height, h, in feet of the rocket at any given time, t, in seconds is given by $h(t) = 192t - 16t^2$.

ROUNDING: If necessary, round to the thousandths place.

a. When will the rocket reach the ground? Write the answer(s) in function notation.

$h(t) = 0$ $0 = 192t - 16t^2$

$16t(12 - t) = 0$

$\frac{16t}{16} = \frac{0}{16}$ | $12 - t = 0$
$t = 0$ sec | $-12 \quad -12$
$\frac{-t}{-1} = \frac{-12}{-1}$ $t = 12$ sec

$h(0) = 0$, $h(12) = 0$

b. When will the rocket reach a height of 512 feet? Write the answer(s) in function notation.

$512 = 192t - 16t^2$

$16t^2 - 192t + 512 = 0$

$16(t^2 - 12t + 32) = 0$

$16(t-8)(t-4) = 0$

$h(4) = 512$, $h(8) = 512$

$16 \neq 0$ | $t - 8 = 0$ | $t - 4 = 0$
$+8 \quad +8$ | $+4 \quad +4$
$t = 8$ sec | $t = 4$ sec

c. When will the rocket reach its maximum height? (vertex)

* it has to happen halfway through the launch & landing
(on the ground at 0sec and 12 sec → 6sec)

$t = 6$ sec

OR

$t = \frac{-192}{2(-16)}$ $t = 6$

d. What is the rocket's maximum height?

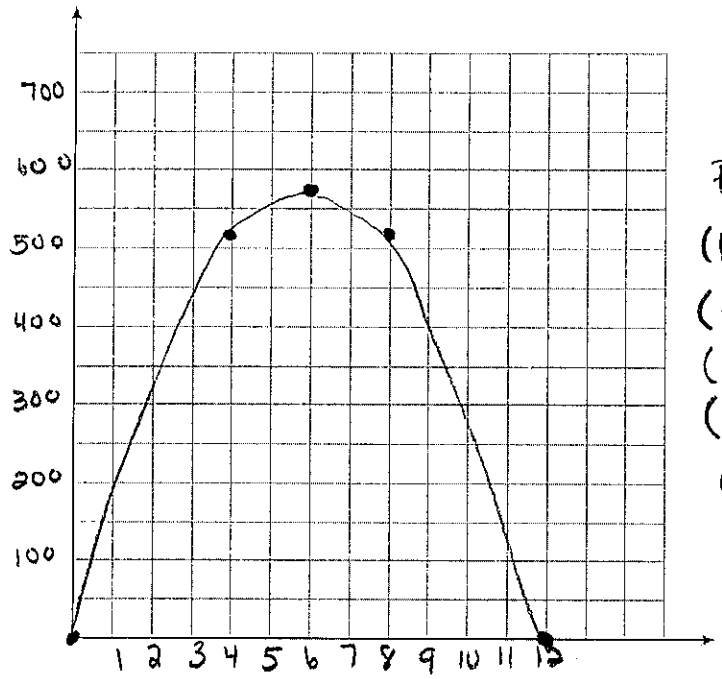
* max height occurs halfway

$h(6) = 192(6) - 16(6)^2$

$h(6) = 1152 - 576 = 576$

$h(6) = 576$ ft

e. Use the answers from parts (a)-(d) to graph this situation.



Plot
(6, 576)
(4, 512)
(8, 512)
(0, 0)
(12, 0)

D: [0, 12]

R: [0, 576]