Chapter 7: Quadratics

Name: Key

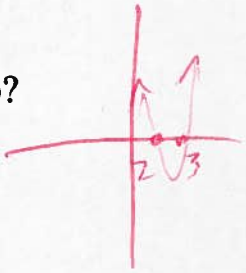
Notes 7.5 Factored Form

Intro:

1) Find the roots for $y = (x - 2)(x - 3)$ without graphing:

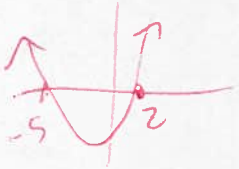
- In other words: What values could x be, that would make y zero?

2 or 3



2) Find the x-intercepts for $y = 2(x - 2)(x + 5)$ without graphing:

$x = 2, -5$

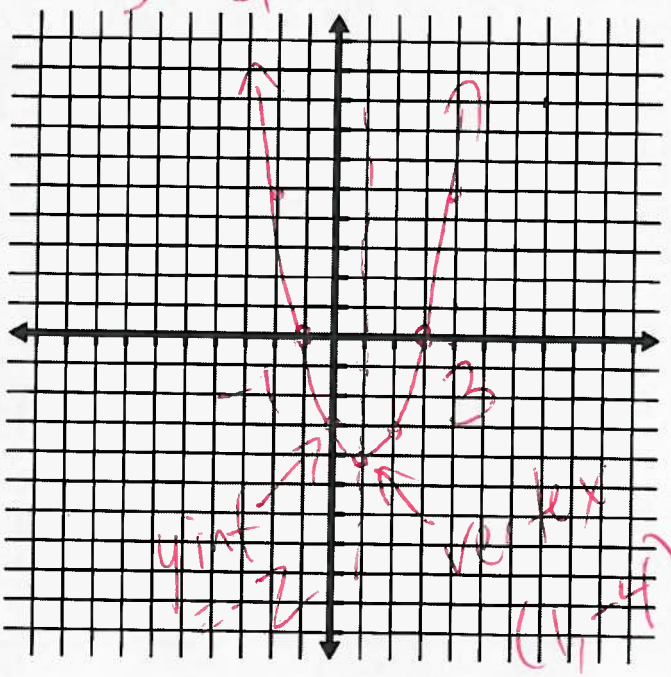


Conclusion:

The Solutions/Zeros/Roots/X-intercepts of a quadratic equation correspond to the factored form **of the equation.**

Example #1: Graph the equation $y = (x - 3)(x + 1)$ without a calculator:

3 -1

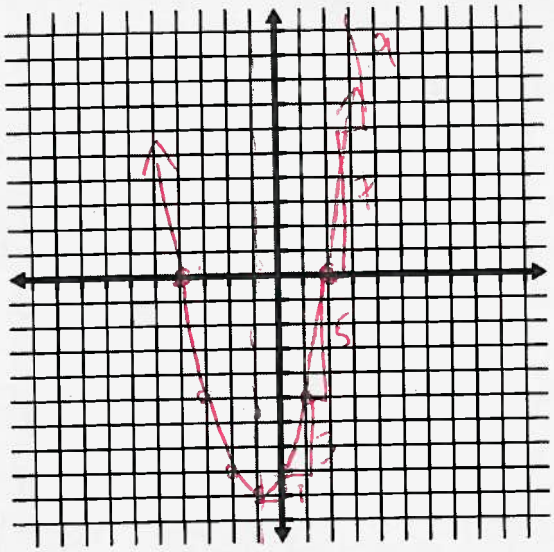


use calculator to find more point

Assignment Part 1

1) $f(x) = (x+4)(x-2)$

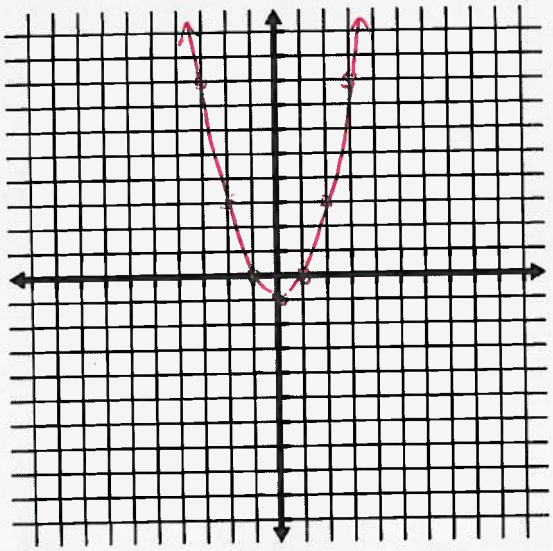
***x*-intercepts**	-4, 2
***y*-intercept**	-8
Equation of the Axis of Symmetry	$x = -1$
Vertex	(-1, -9)



1, 3, 5, 7

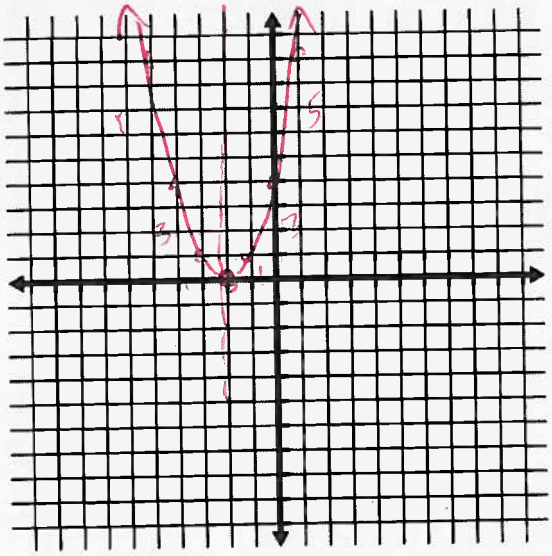
2) $f(x) = (x-1)(x+1)$

***x*-intercepts**	-1, 1
***y*-intercept**	-1
Equation of the Axis of Symmetry	$x = 0$
Vertex	(0, -1)

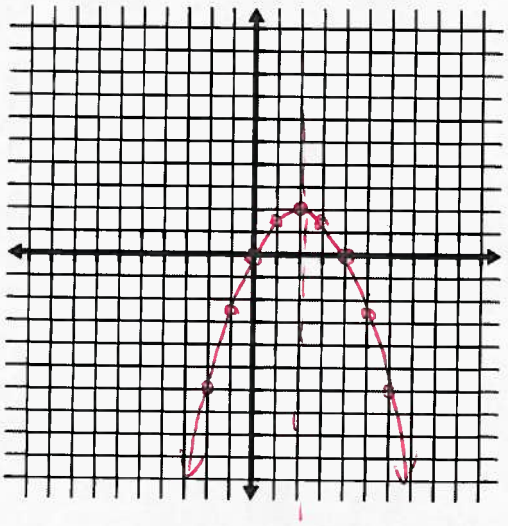


3) $f(x) = (x+2)(x+2)$

***x*-intercepts**	-2
***y*-intercept**	4
Equation of the Axis of Symmetry	$x = -2$
Vertex	(-2, 0)



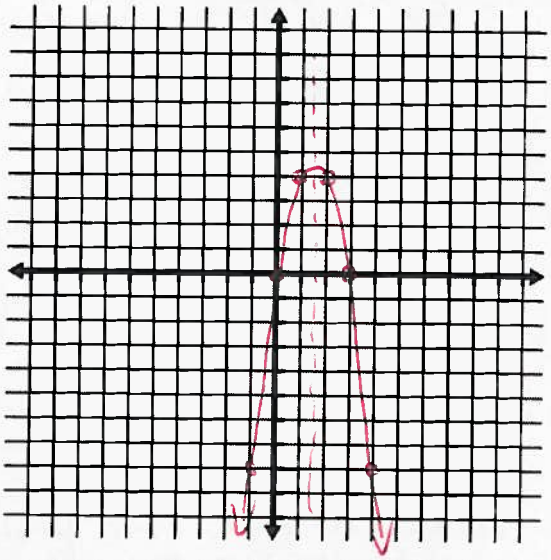
Example #2: Graph the equation $y = -\frac{1}{2}x(x-4)$ without a calculator:



Assignment Part 2

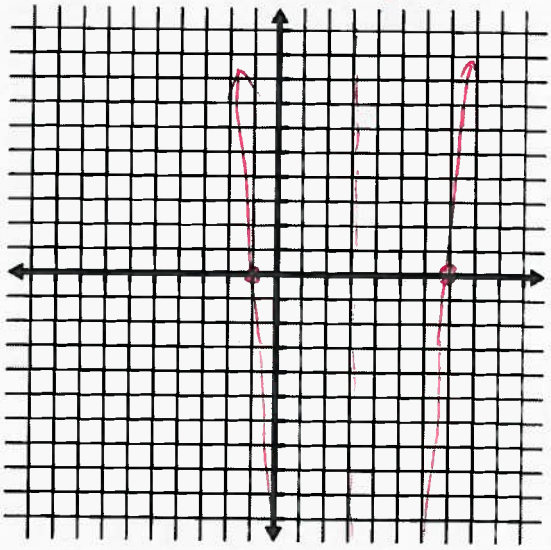
4) $g(x) = -2x(x-3)$

x-intercepts	0, 3
y-intercept	0
Equation of the Axis of Symmetry	x=1.5
Vertex	(1.5, 4.5)



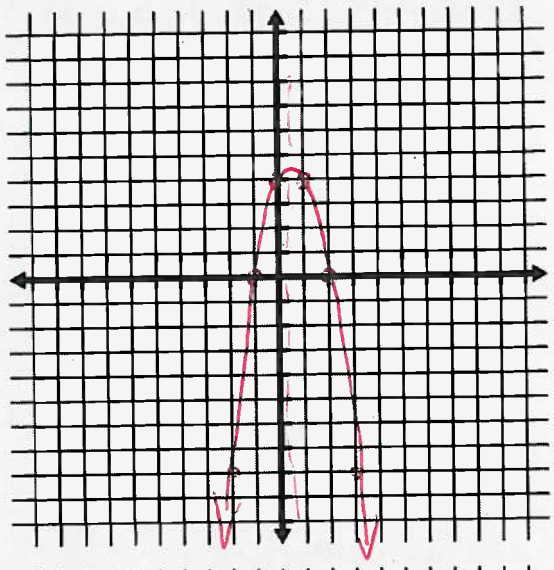
5) $h(x) = 2(x+1)(x-7)$

x-intercepts	-1, 4
y-intercept	-14
Equation of the Axis of Symmetry	x=3
Vertex	(3, -32)



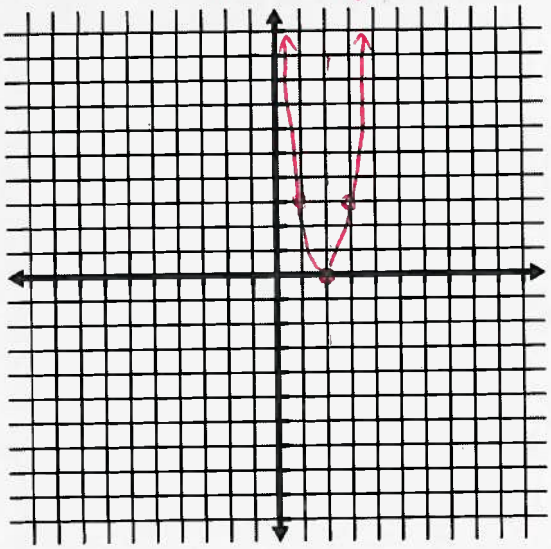
6) $f(x) = -2(x-2)(x+1)$

x-intercepts	-1, 2
y-intercept	4
Equation of the Axis of Symmetry	x=0,5
Vertex	(0.5, 4.5)



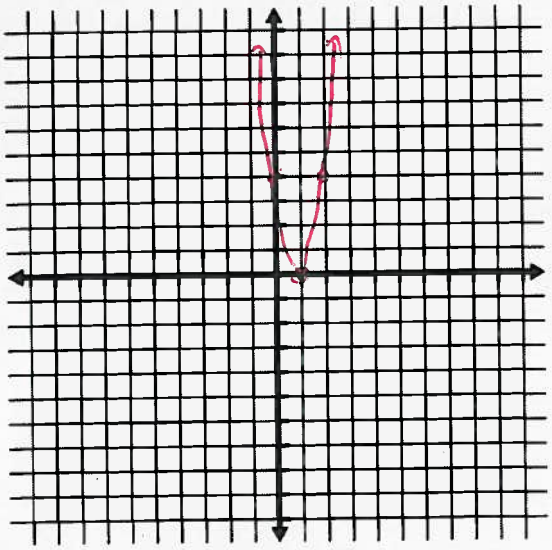
7) $f(x) = 3(x-2)^2$

x-intercepts	2
y-intercept	12
Equation of the Axis of Symmetry	x=2
Vertex	(2,0)

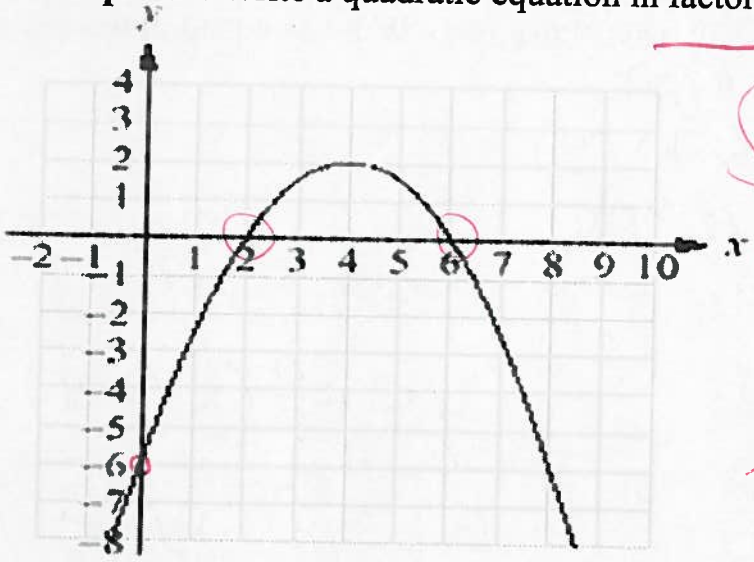


8) $f(x) = 4(x-1)^2$

x-intercepts	1
y-intercept	4
Equation of the Axis of Symmetry	x=1
Vertex	(1,0)



Example #3: Write a quadratic equation in factored form for this parabola:



$y = a(x-2)(x-6)$

$-6 = a(0-2)(0-6)$

$-6 = a(12)$

$-\frac{1}{2} = a$

$y = -\frac{1}{2}(x-2)(x-6)$

Assignment Part 3

9) A parabola has x-intercepts of -3 and 0, and goes through the point (2,-6)

$y = a(x+3)(x)$

$-6 = a(2+3)(2)$

$-6 = 10a$

$-3/5 = a$

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

10) A parabola has x-intercepts of -1 and 5, and a minimum value of -1

(2,-1)

$y = a(x+1)(x-5)$

$-1 = a(2+1)(2-5)$

$-1 = -9a$

$1/9 = a$

$y = \frac{1}{9}(x+1)(x-5)$

11) A parabola has x-intercepts of -4 and 2, and a y-intercept of 4

$y = a(x+4)(x-2)$

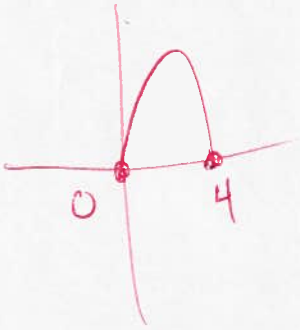
$4 = a(0+4)(0-2)$

$4 = a(-8)$

$-\frac{1}{2} = a$

$y = -\frac{1}{2}(x+4)(x-2)$

Example #5: Johnny kicks a rugby ball in the air and it lands after 4 seconds. After 1 second the ball was 20 feet high. Write an equation to model the time vs. height of the ball.



$y = a(x)(x-4)$

$20 = a(1)(1-4)$

$20 = -3a$

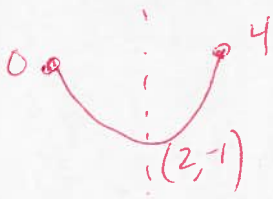
$\frac{20}{-3} = a$

$y = -\frac{20}{3}(x)(x-4)$

$y = -6.7x(x-4)$

Assignment Part 4

12) On the north side of Sir Winston Churchill Provincial Park, located near Lac La Biche, Alberta, people gather to witness the migration of American white pelicans. The pelicans dive underwater to catch fish. Someone observed that a pelican's depth underwater over time could be modeled by a parabola. One pelican was underwater for 4 s. and its maximum depth was 1 m. Determine the quadratic function that defines the parabola, and state the domain and range of the variables.



$y = a(x-0)(x-4)$

$-1 = a(2-0)(2-4)$

$-1 = -4a$

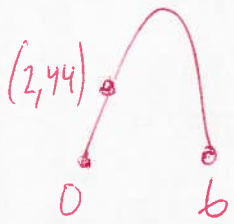
$\frac{1}{4} = a$

$y = \frac{1}{4}x(x-4)$

D: $0 \le x \le 4$

R: $-1 \le y \le 0$

13) A water rocket was launched from the ground, with an initial velocity of 32 m/s. The rocket achieved a height of 44 m after 2 s of flight. The rocket was in the air for 6 s. Determine the quadratic function that models the height of the rocket over time, and state the domain and range of the variables.



$y = a(x-0)(x-6)$

$44 = a(2)(2-6)$

$44 = -8a$

$\frac{44}{-8} = a$

$y = -5.5x(x-6)$

D: $0 \le x \le 6$

R: $0 \le y \le 49.5$

Answers

Part 1

1) $x = -4, 2$ $y = -8$ $x = -1$ (-1,-9)
2) $x = -1, 1$ $y = -1$ $x = 0$ (0,-1)
3) $x = -2$ $y = 4$ $x = -2$ (-2,0)

Part 2

4) $x = 0, 3$ $y = 0$ $x = 1.5$ (1.5,4.5)
5) $x = -1, 7$ $y = -14$ $x = 3$ (3,-32)
6) $x = -1, 2$ $y = 4$ $x = 0$ (0.5,4.5)
7) $x = 2$ $y = 12$ $x = 0$ (2,0)
8) $x = 1$ $y = 4$ $x = 0$ (1,0)

Part 3

9) $y = -\frac{3}{5}x(x+3)$

10) $y = \frac{1}{9}(x+1)(x-5)$

11) $y = \frac{3}{2}(x+4)(x-2)$

Part 4

12) $y = \frac{1}{4}x^2 - x; 0 \leq x \leq 4, -1 \leq y \leq 0$

13) $h = -5.5t^2 + 33t; 0 \leq t \leq 6, 0 \leq h \leq 49.5$