Chapter 7 Review: Quadratics

Textbook p.358-444
Summary: p.396-397, p.441-442
Practice Questions p.398,p.443-444

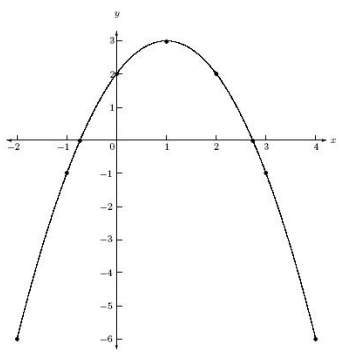
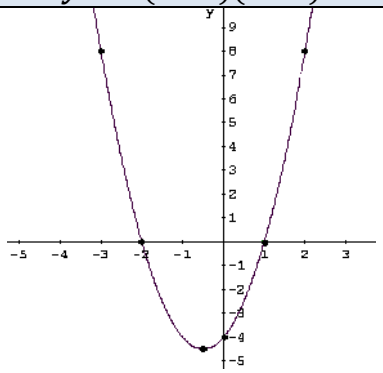
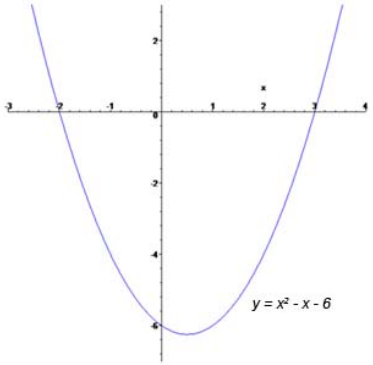
Key Concepts: Quadratic Analysis, Different Forms of Quadratics, Solving Quadratics, Factoring, Quadratic Formula, Modeling with Quadratics.

Definition: A quadratic is any equation with an x^2 in it. (and no $x^{3+}, x^{-n}, \frac{1}{x}, \sqrt{x}, n^x$). The graph of a quadratic equation is in the shape of a **parabola**.

Quadratic Analysis

1) The **vertex** is where the parabola changes direction (either a **maximum** or a **minimum**)
2) The **Axis of Symmetry** for a parabola is a vertical line that goes through the vertex (about which the graph is symmetrical)
3) The **domain** for all quadratics (that aren't restricted in some way by a word problem) is all reals.
4) The **range** for a quadratic is always restricted by either the maximum or minimum point.
5) **Intercepts** occur when the graph crosses the x or y axis.
6) The x-intercepts always correspond to the **factors** of the equation, and are also called **solutions, roots,** or **zeros.**

Different Forms of the quadratic

Vertex Form $y = a(x-p)^2 + q$	**Factored Form** $y = a(x-\ )(x-\ )$	**Standard Form** $y = ax^2 + bx + c$
		
Vertex = (p, q) **p = horizontal shift** **q = vertical shift** **a = stretch factor**	**Factors = x-intercepts**	**c = y-intercept**

You should also be able to find points on a quadratic graph using your calculator. Input the equation in Y=, and use the **CALC** menu.

Solving Quadratics
Solving = finding solutions/roots/zeros/x-intercepts (all the same thing)

Example: Solve $x^2 = x + 6$

Method #1: Factor	**Method #2:** Formula
Method #3: Graph the Zeros	**Method #4:** Graph the Intersections

Quadratic Modeling
Many real-life problems can be modeled using quadratic equations. This involves using information from a question to write a quadratic.

Example #1: A parabola has a y-intercept of -4 and a vertex at (3,-7). Write the equation for this quadratic

Example #2: A parabola has x-intercepts of -3 and 5 and goes through the point (2,15). Write the equation for this quadratic

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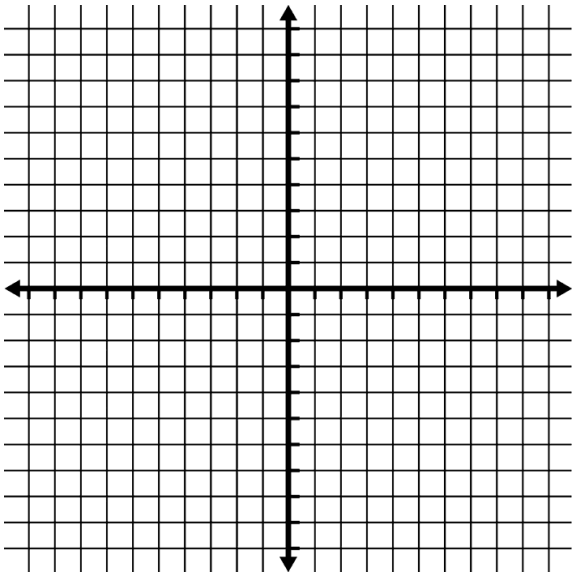
Practice #1: Graph the equation $y = \frac{1}{2}(x-3)^2 - 4$ without a calculator.

p = ____ q = ____ a = ____

vertex = _____

max or min? _____

x	y



Domain: _____
Range: _____

Practice #2: Graph the equation $y = -2(x-3)(x+1)$ without a calculator.

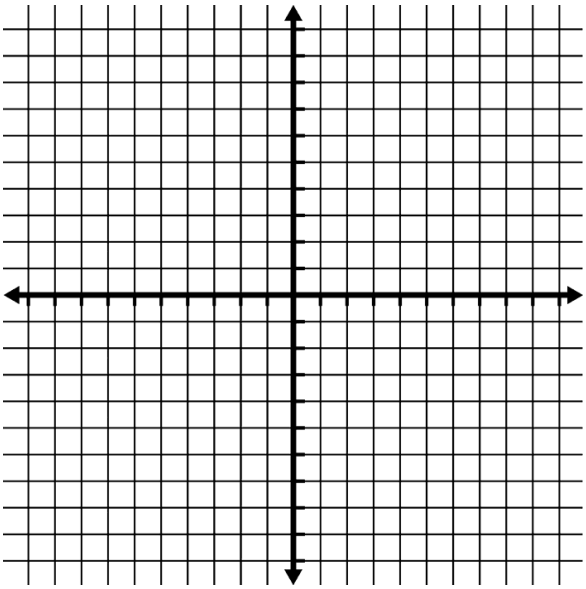
x-ints = _____

a = ____

max or min? _____

Axis of Symmetry? _____

x	y



Domain: _____
Range: _____

Practice #3: Graph the equation $y = -\frac{1}{2}x(x-4)$ without a calculator.

x-ints = _____

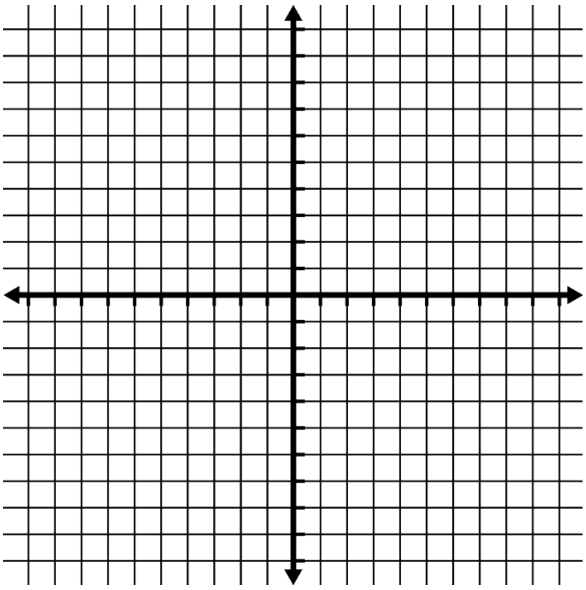
a = ____

max or min? _____

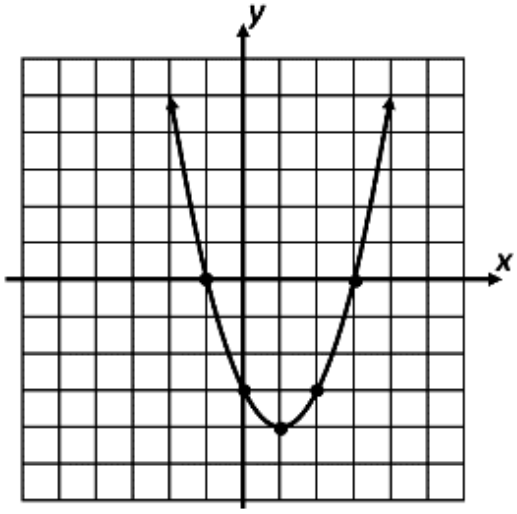
Axis of Symmetry? _____

Domain: _____

Range: _____



Practice #4: Analyze the graph and write an equation to match:



Vertex:

Axis of Symmetry:

Y-Intercept:

X-Intercepts:

Domain:

Range:

Pattern:

Equation:

Practice #5: Solve by graphing: $3x^2 + 4x - 2 = 2x^2 - 2x - 7$

Method #1 – Zeros

Method #2 – Intersections

Practice #6: Solve by factoring

a) $x^2 - 64 = 0$	b) $2x^2 - 16x = -24$
c) $x^2 - 2x - 8 = 0$	d) $2x^2 + 5x - 12 = 0$

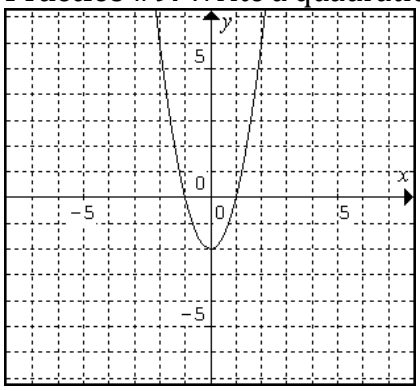
Practice #7: Use the quadratic formula to solve. *Show all answers in EXACT form and SIMPLIFY if possible*

Quadratic Formula: $\boldsymbol{x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$

a) $x^2 + 5x - 3 = 0$	b) $x^2 - 5x = 2$
c) $x^2 = x + 6$	d) $x^2 + 4x + 4 = 0$

Practice #8: Write an equation for a parabola that has x-intercepts of -4 and 6 with a y-intercept of 50.

Practice #9: Write a quadratic equation in factored form for this parabola:



Practice #10: David dives from a spring board. His height, h metres, above the water t seconds after release is given by $h = -4.9t^2 + 8.8t + 5$

a) What is the domain and range for this word problem?

b) How high is the diving board?

c) What is David maximum height?

d) How long is David in the air for?

Practice #11: Bonnie launches a model rocket from the ground with an initial velocity of 68 m/s. The following function, *h(t)*, can be used to model the height of the rocket, in metres, over time, *t*, in seconds:

$$h(t) = -4.9t^2 + 68t$$

Bonnie's friend Sasha is watching from a lookout point at a safe distance. Sasha's eye level is 72m above the ground. At what time during the flight will the rocket be at Sasha's eye level?

Practice #11: A store rents an average of 750 video games each month at the current rate of $4.50. The owners of the store want to raise the rental rate to increase the revenue to $6000 per month. However, for every $1 increase, they know that they will rent 30 fewer games each month because some people won't be willing to pay higher prices. What rate should they set for video game rentals?

Practice #12: 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.

Practice #13: Gary is competing the National Diving Championships. He does a triple-back flip off the 10m tower. If Gary's maximum height of 10.85m occurred just 0.42s after jumping, then how long will it take him to hit the water?

Practice #14: The length of a rectangular garden is 4m more than its width. Determine the dimensions of the garden if the area is 117 m^2.