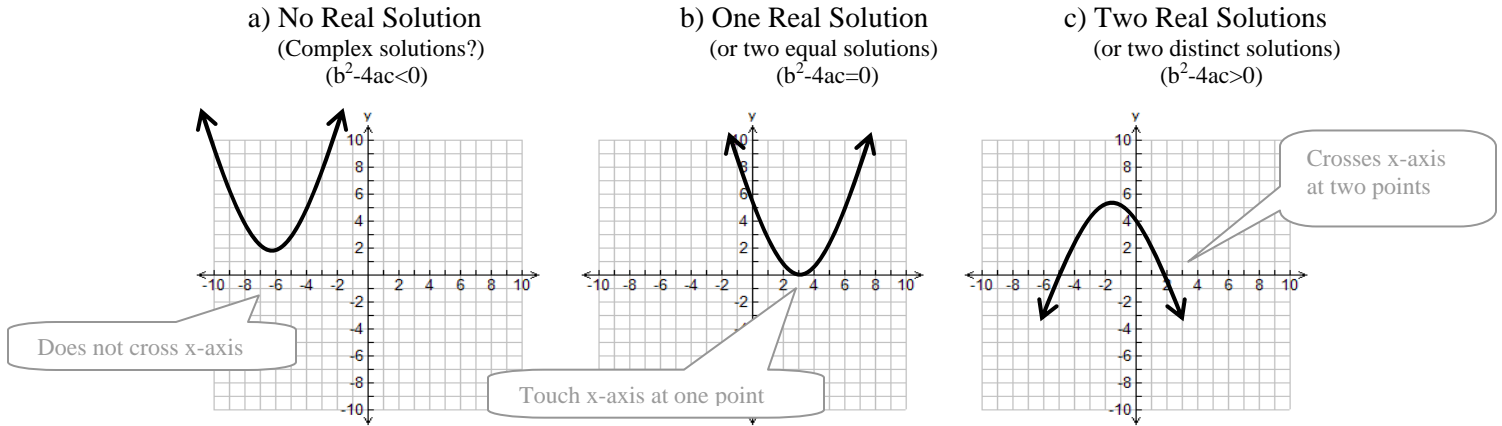


3.2 – Quadratic Equations

Quadratic (2nd degree) equations take the standard form; $Ax^2 + Bx + C = 0$

Three possible solutions exist when trying to solve these equations. One can check the **discriminant**, $d = b^2 - 4ac$, to determine the number of solutions but these are best shown graphically as outlined below.



One can solve quadratic equations in several ways as outlined in the table below.

Method	How it works	Advantages/Disadvantages
Graphically	Graph then examine the corresponding function to see at what x- value the function equals the values you are interested in.	Great visual method proves useful especially when solving inequalities. Not always accurate
Algebraically Using Factoring	Set function equal to value you want to solve for, rearrange the equation to zero, and then factor to find x-value(s) if they exist	Generates accurately solutions for integral factors
Algebraically Using Formula	Another algebraic method than uses a formula to generate solutions. Formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	Works for all Real numbers Can program formula into calculator so just need to enter coefficients a, b, c

Example 1: Solve the following quadratic equations algebraically

Zero Principle
one of the multipliers must be zero to give zero result

a) $0 = x^2 + 5x - 36$
 $0 = (x + 9)(x - 4)$
 So $0 = x + 9$ or $0 = x - 4$
 $-9 = x$ $4 = x$
 Therefore $x = -9, 4$

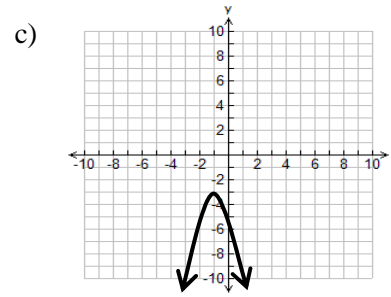
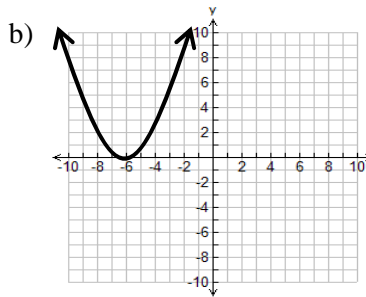
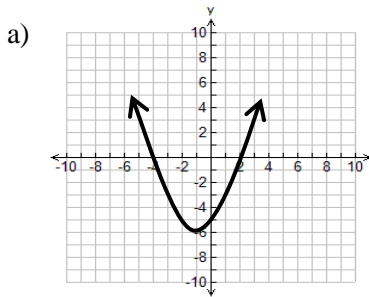
b) $x^2 - 6x = -9$
 $x^2 - 6x + 9 = 0$
 $(x - 3)^2 = 0$
 $x = 3$
 One solution

c) $4x = 3x^2 + 8$
 $0 = 3x^2 - 4x + 8$
 no real solution
 Discriminant provides quick check for the nature of the roots. ($b^2 - 4ac < 0$)

Rearrange in descending order

3.2 – Quadratic Equations Practice Questions

1. Find the roots for each of the following functions.



2. Solve the following quadratic (2nd degree) equations.

a) $(x + 2)(x + 3) = 0$	b) $x^2 - 4x + 3 = 0$	c) $y^2 - y - 56 = 0$	d) $(2m - 1)(3m + 5) = 0$
e) $x^2 + 3x = 10$	f) $m^2 = 64$	g) $24 = x^2 - 2x$	h) $10x = 25 + x^2$
i) $5x^2 - x - 18 = 0$	j) $6y^2 + 17y - 14 = 0$	k) $2x^2 + 72 = 24x$	l) $2x(x + 3) = 5(x + 2)$
m) $4x^2 = 3 + 11x$	n) $9x^2 = 17x - 8$	o) $\frac{x^2}{2} - \frac{x}{3} - \frac{1}{6} = 0$	p) $2x^2 = 5x$

3. Write a quadratic equation with the following solutions.

a) $x = 3, -1$	b) $x = 5$	c) $x = 0, x = 1$	d) $x = -7, 3$
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4. A ball thrown in the has its height, in meters, described by the function $h(t) = -5t^2 + 20t + 2$, where time is measured in seconds. Determine;

- to the nearest tenth, when the ball hits the ground.
- for how long the ball is above 17m high.

Answers 1. a) $x = -4, 2$ b) $x = -6$ c) no real solution 2. a) $x = -2, -3$ b) $x = 1, 3$ c) $y = -7, 8$ d) $m = 1/2, -5/3$ e) $x = -5, 2$ f) $m = \pm 8$
g) $x = -4, 6$ h) $x = 5$ i) $x = -1.8, 2$ j) $y = 2/3, -3.5$ k) $x = 6$ l) $x = -2.5, 2$ m) $x = 3, -1/4$ n) $x = 1, 8/9$ o) $x = 1, -1/3$
p) $x = 0, 2.5$ 3. a) $(x+3)(x+1) = 0$ or $x^2 - 2x - 3 = 0$ b) $(x-5)^2$ or $x^2 - 10x + 25 = 0$ c) $x(x-1)$ or $x^2 - x = 0$ d) $x^2 + 4x - 21 = 0$
4. a) 4.1s b) 2s