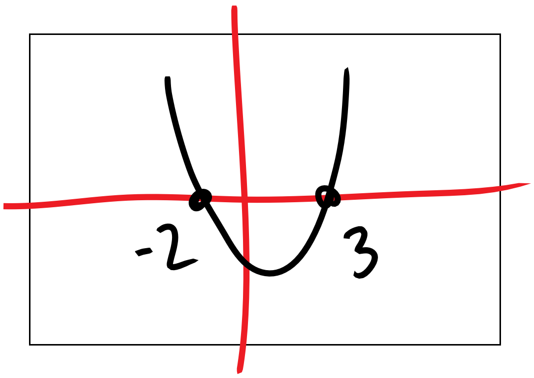
Name: ______________________

Lesson 4.4 Solving Quadratics

Solving = figuring out 'x' when equation = 0

Solution = zeros = roots = x-intercepts

Example #1: Find the zeros for the equation $y = x^2 - x - 6$ by graphing



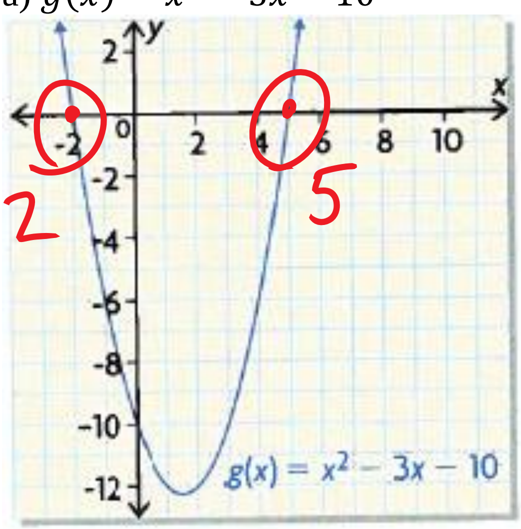
CALC zeros

x = -2 or 3

Assignment Part 1:

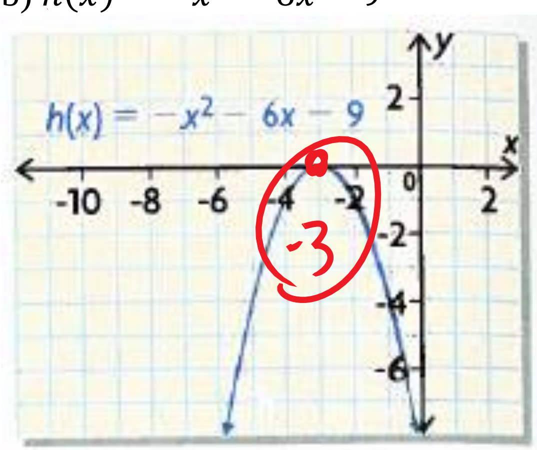
1) look at the graph and find the roots:

a) $g(x) = x^2 - 3x - 10$



-2 5

b) $h(x) = -x^2 - 6x - 9$



2) Graph on your calculator and find the zeros

a) $2x^2 - 5x - 3 = 0$

-0.5, 3

b) $9x - 4x^2 = 0$

0, 2.25

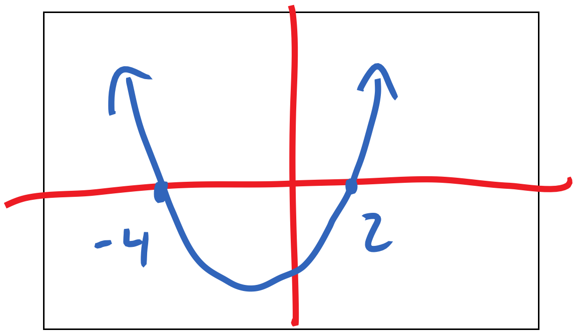
Example #2: Find the zeros for the equation $x^2 + 2x = 8$ by graphing

Method #1

Solve for zero

$x^2 + 2x = 8$

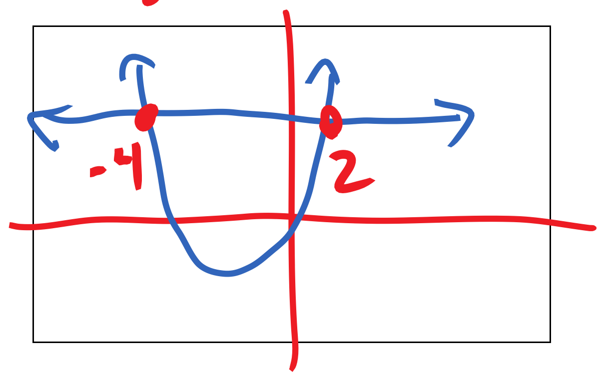
$x^2 + 2x - 8 = 0$



Method #2

$Y_1 = x^2 + 2x$

$Y_2 = 8$



Assignment Part 2:

a) $x^2 + 5x = 24$ **Method #1** $x^2 + 5x - 24 = 0$ zeros = $-8, 3$	$x^2 + 5x = 24$ **Method #2** $Y_1 = x^2 + 5x$ $Y_2 = 24$ ints = $-8, 3$
b) $0.5x^2 = -2x + 3$ **Method #1** $0.5x^2 + 2x - 3 = 0$ zeros = $-5.2, 1.2$	$0.5x^2 = -2x + 3$ **Method #2** $Y_1 = 0.5x^2$ $Y_2 = -2x + 3$ ints = $-5.2, 1.2$

c) $6a^2 = 11a + 35$ **Method #1** $6a^2 - 11a - 35 = 0$ zeros = $-1.7, 3.5$	$6a^2 = 11a + 35$ **Method #2** $Y_1 = 6x^2$ $Y_2 = 11x + 35$ ints = $-1.7, 3.5$
d) $2p^2 + 3p = 1 - 2p$ **Method #1** $2p^2 + 5p - 1 = 0$ zeros = $-2.7, 0.2$	$2p^2 + 3p = 1 - 2p$ **Method #2** $Y_1 = 2x^2 + 3x$ $Y_2 = 1 - 2x$ ints = $-2.7, 0.2$

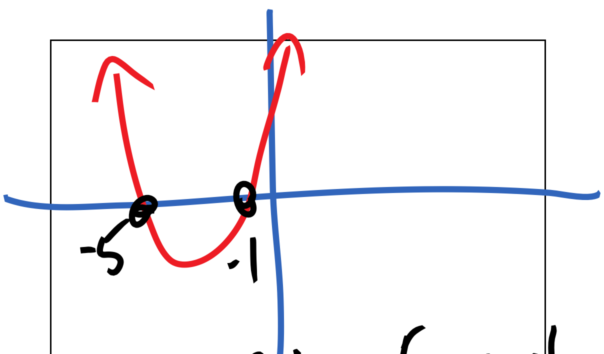
Example #3: Solve by graphing: $3x^2 + 4x - 2 = 2x^2 - 2x - 7$

Method #1

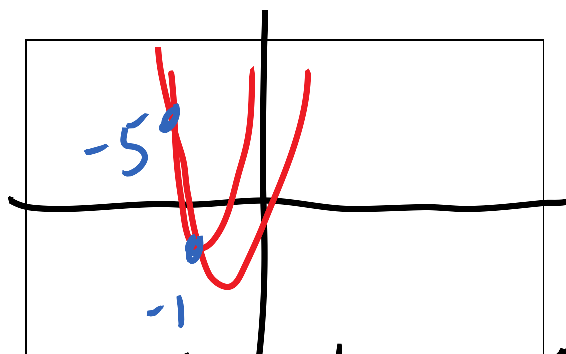
$3x^2 + 4x - 2 = 2x^2 - 2x - 7$
$-2x^2 + 2x + 7$
$x^2 + 6x + 5 = 0$

Method #2

$Y_1 = 3x^2 + 4x - 2$
$Y_2 = 2x^2 - 2x - 7$



zeros = -5 or -1



intersections = -5 or -1

Assignment Part 3:

a) $5x^2 - 2x = 4x + 3$ **Method #1** $5x^2 - 6x - 3 = 0$ zeros: $-.38, 1.58$	$5x^2 - 2x = 4x + 3$ **Method #2** $Y_1 = 5x^2 - 2x$ $Y_2 = 4x + 3$ ints: $-.38, 1.58$
b) $-2x^2 + x - 1 = x^2 - 3x - 7$ **M #1** $-3x^2 + 4x + 6 = 0$ zeros: $-0.9, 2.2$	$-2x^2 + x - 1 = x^2 - 3x - 7$ **M #2** $Y_1 = -2x^2 + x - 1$ $Y_2 = x^2 - 3x - 7$ ints: $-0.9, 2.2$
c) $3x^2 - 12x + 17 = -4(x-2)^2 + 5$ $3x^2 - 12x + 17 + 4(x-2)^2 - 5 = 0$ zeros $= 2$	$3x^2 - 12x + 17 = -4(x-2)^2 + 5$ $Y_1 = 3x^2 - 12x + 17$ $Y_2 = -4(x-2)^2 + 5$ int $= 2$
d) $5x^2 + 4x + 3 = -x^2 - 2x$ $6x^2 + 6x + 3 = 0$ zeros: NONE	$5x^2 + 4x + 3 = -x^2 - 2x$ $Y_1 = 5x^2 + 4x + 3$ $Y_2 = -x^2 - 2x$ int: NONE

Example #3: 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:

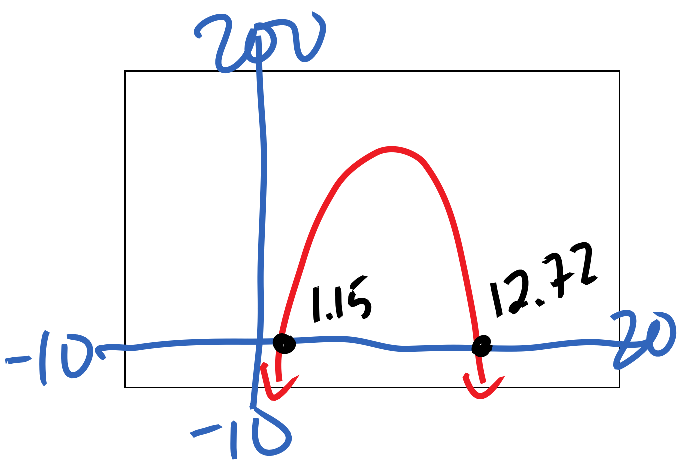
$$h(t) = -4.9t^2 + 68t$$

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?

Method #1

$72 = -4.9x^2 + 68x$

$0 = -4.9x^2 + 68x - 72$



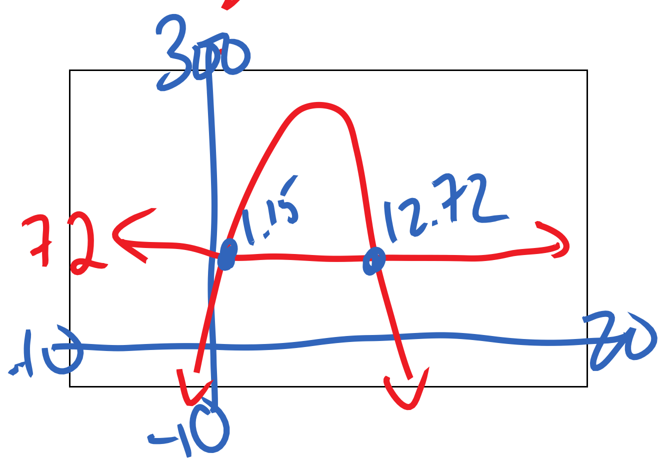
CALC zeros

$= 1.15$ or 12.72

Method #2

$Y_1 = -4.9x^2 + 68x$

$Y_2 = 72$



CALC intersect

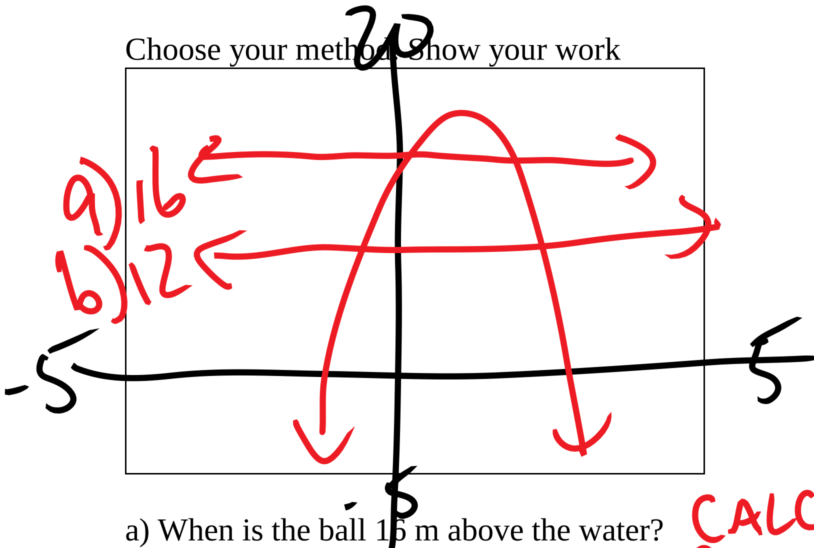
$= 1.15$ or 12.72

Assignment Part 4:

1) A ball is thrown into the air from a bridge that is 14m above a river. The function that models the height, *h(t)*, in metres of the ball over time, *t*, in seconds is:

$$h(t) = -4.9t^2 + 8t + 14$$

Choose your method. Show your work



a) When is the ball 16 m above the water? CALC intersect = .31, 1.32

b) When in the ball 12m above the water? CALC intersect = ~~.22~~, 1.85

c) Is the ball ever 18 m above the water? Explain how you know. NO

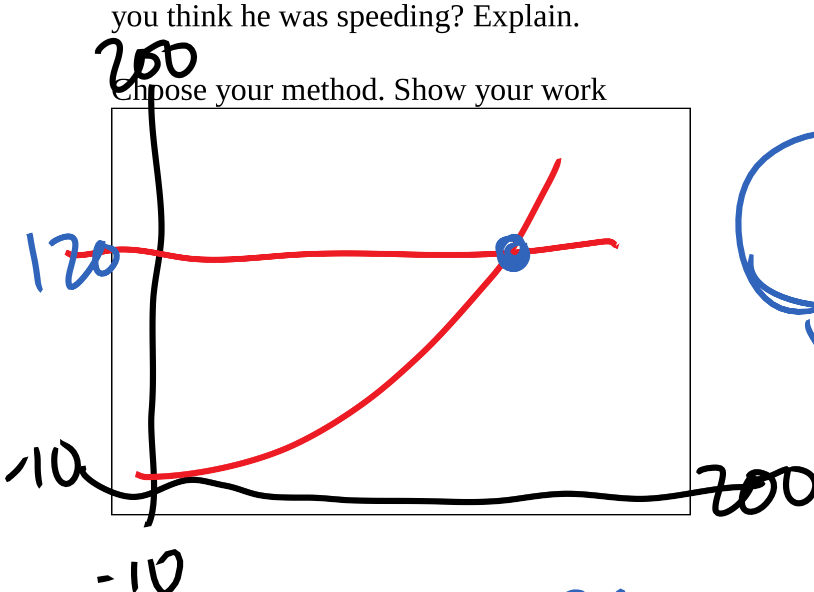
d) When does the ball hit the water? CALC zero = 2.69 s

2) The stopping distance, *d*, of a car, in metres, depends on the speed of the car, *s*, in kilometres per hour. For a certain car on a dry road, the equation for stopping distance is:

$$d = 0.0059s^2 + 0.187s$$

The driver of the car slammed on his brakes to avoid an accident, creating skid marks that were 120m long. He told the police that he was driving at the speed limit of 100 km/h. Do you think he was speeding? Explain.

Choose your method. Show your work



$\underbrace{120}_{Y_2} = \underbrace{0.0059s^2 + .187s}_{Y_1}$

CALC intersect = 127.65

More Practice

Solve for 'x' using either method.

1) $0.5z^2 + 3z - 2 = 0$	2) $0.09x^2 + 0.30x + 0.25 = 0$
3) $5p = 3 - 2p^2$	4) $x^2 - 3x - 8 = -2x^2 + 8x + 1$

Answer Key

Part 1:

1) a) x = -2,5 b) x = -3
2) a) x = -0.5, 3 b) x = 0, 2.25

Part 2:

a) x = -8,3 b) x = -5.2,1.2
c) x = -1.7, 3.5 d) p = -2.7, 0.2

Part 3:

a) x = -0.38, 1.58 b) x = -0.9, 2.2
c) x = 2 d) *no solution*

Part 4:

1) a) t = 0.31s and t = 1.32s
b) t = 1.85s
c) No; the maximum height is less than 18.
d) t = 2.69s

2) Yes, solving $120 = 0.0059s^2 + 0.187$s indicates that the driver was travelling 127.65 km/h.

Extra Practice

1) x = -6.6, 0.6
2) x = -1.7
3) p = -3, 0.5
4) x = -0.7, 4.4

Practice Quiz

1) Solve by graphing: $4x^2 - 2x - 6 = 3x^2 - 5x - 2$

Method #1 **Method #2**

Zeros = ________________________ Intersections = __________________