

Last day's work: pp. 300-301 #3bce, 4c, 6, 9bd
p. 300 (top) #C2
Enrichment: p. 302 #14

2 day's ago:
p. 300 #1*, 2*

Today's Learning Goal(s):

By the end of the class, I will be able to:

- a) solve problems involving quadratic equations.

Old Solutions:

p. 300 36) $y = 2x^2 - 5x - 12$

 x -int, let $y = 0$

$0 = 2x^2 - 5x - 12$

$0 = (2x + 3)(x - 4)$

$\therefore x = -\frac{3}{2}$ or $x = 4$
($= -1.5$)

$x = \frac{-b}{2a}$

$= \frac{-(-5)}{2(2)}$

$= \frac{5}{4}$

(= 1.25)

$y = (2x + 3)(x - 4)$

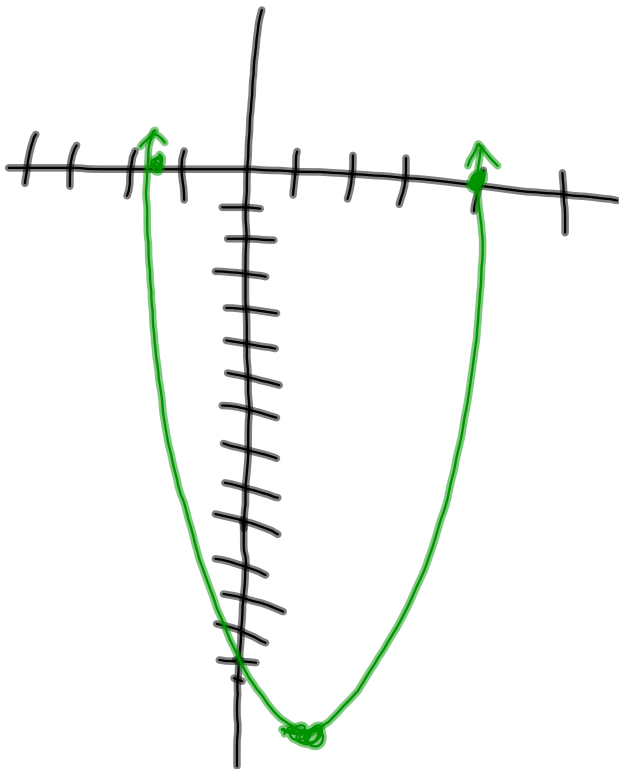
$= (2(\frac{5}{4}) + 3)(\frac{5}{4} - 4)$

$= (\frac{5}{2} + \frac{6}{2})(\frac{5}{4} - \frac{16}{4})$

$= (\frac{11}{2})(-\frac{11}{4})$

$= -\frac{121}{8}$

(= -15.125)



Old Solutions:

p. 300

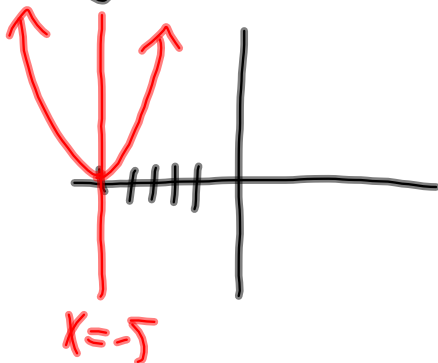
$$3c) y = x^2 + 10x + 25 \quad 3e) y = x^2 - 2x + 3$$

$$= (x+5)^2$$

$$\therefore V(-5, 0)$$

$$x\text{-int} = -5$$

$$A \text{ of } S: x = -5$$



$$x\text{-int, let } y = 0$$

$$0 = x^2 - 2x + 3$$

$$a = 1 \quad b = -2 \quad c = 3$$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(3)}}{2(1)}$$

$$= \frac{2 \pm \sqrt{4 - 12}}{2}$$

$$= \frac{2 \pm \sqrt{-8}}{2}$$

2

\therefore No Real
roots

\therefore no x-intercepts

A of S:

$$x = \frac{-b}{2a}$$

$$= \frac{-(-2)}{2(1)}$$

$$= \frac{2}{2}$$

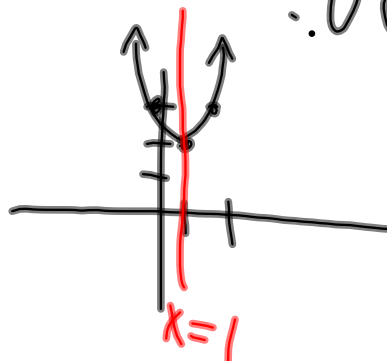
$$= 1$$

$$y = (1)^2 - 2(1) + 3$$

$$= 1 - 2 + 3$$

$$= 2$$

$$\therefore V(1, 2)$$



p. 300 4c) $y = 2(x+4)^2 - 5$

$v(-4, -5)$ opens up



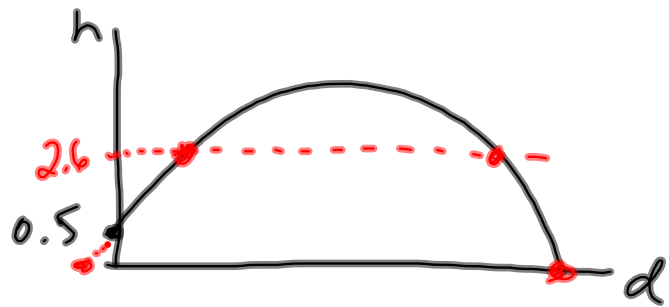
p. 301 #6

Old Solutions:

For help with question 6, see Example 4.

6. The path of a soccer ball after it is kicked from a height of 0.5 m above the ground is given by the equation $h = -0.1d^2 + d + 0.5$, where h is the height, in metres, above the ground and d is the horizontal distance, in metres.

- a) How far has the soccer ball travelled horizontally, to the nearest tenth of a metre, when it lands on the ground?
- b) Find the horizontal distance when the soccer ball is at a height of 2.6 m above the ground.



a) ball lands when $h=0$

$$0 = -0.1d^2 + d + 0.5$$

$$\therefore a = -0.1 \quad b = 1 \quad c = 0.5$$

$$d = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(-0.1)(0.5)}}{2(-0.1)}$$

$$= \frac{-1 \pm \sqrt{1 + 0.2}}{-0.2}$$

$$d = \frac{-1 + \sqrt{1.2}}{-0.2} \quad \text{or} \quad d = \frac{-1 - \sqrt{1.2}}{-0.2}$$

$$\approx -0.477$$

inadmissible

$$\approx 10.47$$

$$\approx 10.5 \text{ m}$$

\therefore the ball travels 10.5 m horizontally.

b) let $h = 2.6$

$$2.6 = -0.1d^2 + d + 0.5$$

$$0 = -0.1d^2 + d + 0.5 - 2.6$$

$$0 = -0.1d^2 + d - 2.1$$

$$\therefore a = -0.1 \quad b = 1 \quad c = -2.1$$

$$d = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(-0.1)(-2.1)}}{2(-0.1)}$$

$$= \frac{-1 \pm \sqrt{1 - 0.84}}{-0.2}$$

$$= \frac{-1 \pm \sqrt{0.16}}{-0.2}$$

$$d = \frac{-1 + 0.4}{-0.2} \quad \text{or} \quad d = \frac{-1 - 0.4}{-0.2}$$

$$= 3$$

up

$$= 7$$

down.

p.301

Old Solutions:

$$9b) 4x^2 = 12 - 13x$$

$$4x^2 + 13x - 12 = 0$$

$$a=4 \quad b=13 \quad c=-12$$

$$x = \frac{-13 \pm \sqrt{(13)^2 - 4(4)(-12)}}{2(4)}$$

$$= \frac{-13 \pm \sqrt{169 + 192}}{8}$$

$$= \frac{-13 \pm \sqrt{361}}{8}$$

$$x = \frac{-13 + 19}{8} \quad \text{or} \quad x = \frac{-13 - 19}{8}$$

$$= \frac{6}{8}$$

$$= 0.75$$

$$= \frac{-32}{8}$$

$$= -4$$

$$d) x(3x-8) = -1$$

$$3x^2 - 8x + 1 = 0$$

$$a=3 \quad b=-8 \quad c=1$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(3)(1)}}{2(3)}$$

$$= \frac{8 \pm \sqrt{64 - 12}}{6}$$

$$= \frac{8 \pm \sqrt{52}}{6}$$

$$x = \frac{8 + \sqrt{52}}{6} \quad \text{or} \quad x = \frac{8 - \sqrt{52}}{6}$$

$$\approx 2.535$$

$$\approx 2.54$$

$$\approx 0.131$$

$$\approx 0.13$$

3UI Expectation:

$$= \frac{8 \pm \sqrt{52}}{6}$$

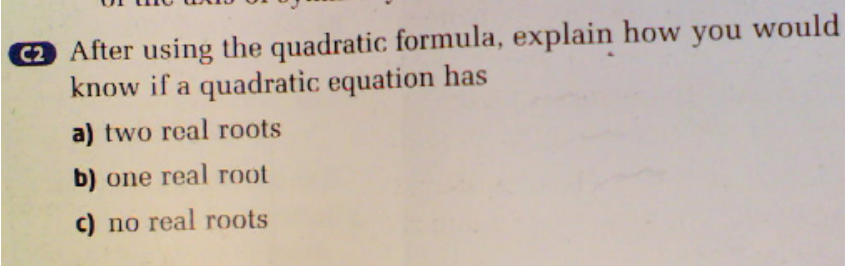
$$x = \frac{8 + \sqrt{52}}{6} \quad \text{or} \quad x = \frac{8 - \sqrt{52}}{6}$$

$$= \frac{8 + \sqrt{4} \sqrt{13}}{6}$$

$$= \frac{\cancel{8} + \frac{4}{\cancel{2}} \sqrt{13}}{\cancel{6} \cdot 3}$$

$$= \frac{4 + \sqrt{13}}{3}$$

Old Solutions:



a) two real roots
most common

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

c) No real roots

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

if $b^2 - 4ac < 0$
↑
negative

b) one real root

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

$$b^2 - 4ac = 0$$

MPM 2DI

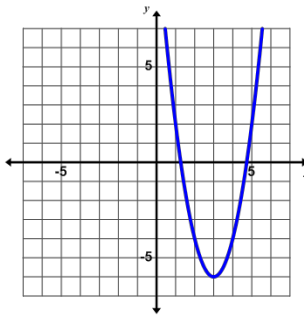
6.5 Solve Problems Using Quadratic Equations (Day1)

Date: Dec. 6/16Recall: For any quadratic relation $y = ax^2 + bx + c$ To find the x -intercepts (or zeros).☞ Let $y = 0$.

$$0 = ax^2 + bx + c$$

☞ Now use the quadratic (root) formula.

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



To find the vertex or to find the maximum or minimum.

☞ Complete the square.

or

☞ Find the axis of symmetry.

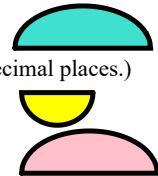
$$x = \frac{-b}{2a}$$

☞ Now substitute x into the relation to find y , the max./min. value.*Typed solution on next slide...*

Ex. 1 Max punts a football off the roof of the school.

It's height, h , in metres is given by $h = -4.9t^2 + 30t + 12$, where t , is the time in seconds.

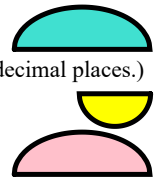
- What is the height of the school?
- What is the maximum height reached by the ball and when does it reach it? (Use 2 decimal places.)
- When does the football hit the ground? (Use 2 decimal places.)
- When is the football 25 m above the ground? (Use 2 decimal places.)



Ex. 1 Max punts a football off the roof of the school.

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- When is the football 25 m above the ground? (Use 2 decimal places.)



a) Max is still holding the football when $t=0$,
the height of the school is 12 m.

b) The maximum height occurs at the vertex.

$$t = \frac{-b}{2a}$$

$$= \frac{-(30)}{2(-4.9)}$$

$$= \frac{-30}{-9.8}$$

$$\doteq 3.061$$

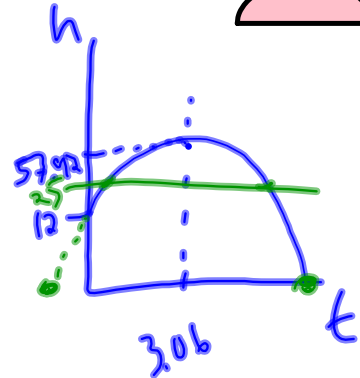
$$\doteq 3.06 \text{ sec}$$

$$h \doteq -4.9(3.06)^2 + 30(3.06) + 12$$

$$\doteq 57.918$$

$$\doteq 57.92 \text{ m}$$

the maximum height is 57.92 m,
and occurs at 3.06 s.



c) The football is on the ground when $h=0$,

$$\therefore 0 = -4.9t^2 + 30t + 12$$

$a = -4.9$ $b = 30$ $c = 12$

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(30) \pm \sqrt{(30)^2 - 4(-4.9)(12)}}{2(-4.9)}$$

$$= \frac{(-30 \pm \sqrt{1135.2})}{-9.8}$$

$$\therefore t \doteq -0.376$$

inadmissible

$$\therefore t \doteq 6.499$$

$$\doteq 6.50 \text{ s}$$

(time must be positive)

the football hits the ground at 6.5 s.

d) Let $h = 25$

$$\therefore 25 = -4.9t^2 + 30t + 12$$

$$0 = -4.9t^2 + 30t + 12 - 25$$

$$0 = -4.9t^2 + 30t - 13$$

$$a = -4.9 \quad b = 30 \quad c = -13$$

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(30) \pm \sqrt{(30)^2 - 4(-4.9)(-13)}}{2(-4.9)}$$

$$= \frac{-30 \pm \sqrt{645.2}}{-9.8}$$

$$\therefore t \doteq 0.469$$

$$\doteq 0.47 \text{ s}$$

$$\therefore t \doteq 5.653$$

$$\doteq 5.65 \text{ s}$$

the ball is 25 m above the ground
at 0.47 s on the way up,
and 5.65 s on the way down.

Ex. 2 The product of two consecutive odd integers is 143. Find the integers.

Let x represent the first consecutive *odd* number.

Let $x+2$ represent the second consecutive *odd* number.

$$x(x+2) = 143$$

$$x^2 + 2x - 143 = 0$$

$$(x+13)(x-11) = 0$$

$$\text{if } x = -13 \quad \text{or } x = 11$$

$$x+2 \quad \text{then } x+2$$

$$= -13+2 \quad = 11+2$$

$$= -11 \quad = 13$$

\therefore the integers are -11 & -13 . or \therefore the integers are 11 & 13 .

Today's practice: pp. 312-313 #4, 5, 6, 9, 11, 13,

Enrichment: pp. 455-457 #39, 41, 54, 53a

Extra time? *Done Fall 2016*
Correct Unit 5 Summative.

Extra time?

Show the development of the Quadratic Formula by Completing the Square?

$$ax^2 + bx + c = 0$$

Attachments

PopGoestheWeasel.mid