Solving Quadratic Equations

Apr. 21/2016

Recall:

To solve an equation, find value(s) that satisfy the equation (i.e., make it true).

This value is called the solution or root of the equation.

Ex.1 Solve $x^2 - 12x + 32 = 0$

S -12
P 32
I -8, -4

$x^2 - 8x - 4x + 32 = 0$

$x(x-8) - 4(x-8) = 0$

$(x-8)(x-4) = 0$

$x - 8 = 0$ or $x - 4 = 0$

$x = 8$ $x = 4$

Verify $x = 4$: LS/RS

$LS = x^2 - 12x + 32$ $RS = 0$

$= (4)^2 - 12(4) + 32$ $LS = RS$ ✓

$= 16 - 48 + 32$

$= 0$

Apr 19-7:41 PM

We have most often solved for the zeroes of the quadratic equation, but we can solve for any value.

Ex.2 Solve $y = 2x^2 + 5x - 12$ for (a) $y = 0$
(b) $y = -12$

(a) $y = 0$

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

S 5
P -24
I 8, -3

$0 = 2x^2 + 8x - 3x - 12$

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

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

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

$x = -4$ $2x = 3$

$x = \frac{3}{2}$

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Ex.2 Solve $y = 2x^2 + 5x - 12$ for (a) $y = 0$
(b) $y = -12$

(b) $y = -12$

y-int : $(0, -12)$
matching : $(x, -12)$

$-12 = 2x^2 + 5x - 12$
$+12 \qquad +12$

$0 = 2x^2 + 5x$

$0 = x(2x+5)$

$x = 0$ or $2x + 5 = 0$

$2x = -5$

$x = \frac{-5}{2}$

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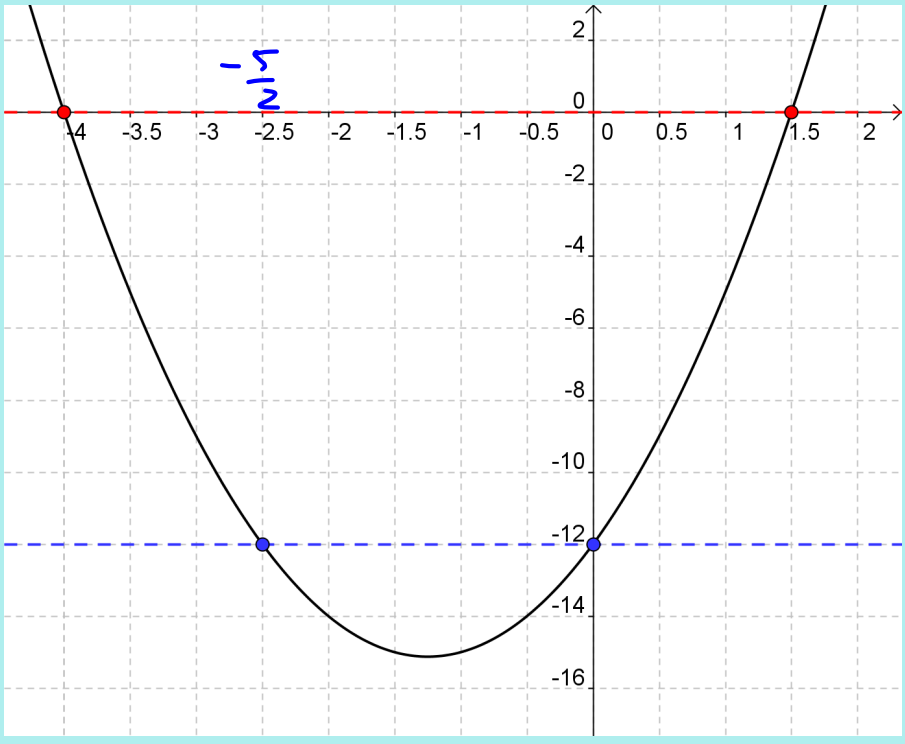
Ex.2 Solve $y = 2x^2 + 5x - 12$ for (a) $y = 0$
(b) $y = -12$



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To solve using factored form:

1) Expand all terms

2) Move all terms to one side of the equal sign so that the equation equals zero

3) Factor your expression (if possible)

4) Set each factor equal to zero and solve

Ex.3 Solve: $x^2 - 10 = -x(2x + 13)$

① $x^2 - 10 = -2x^2 - 13x$

②

$x^2 - 10 = -2x^2 - 13x$

$-x^2 \quad +10 \quad -x^2 \quad +10$

$(-1)(0 = -3x^2 - 13x + 10)$

$0 = 3x^2 + 13x - 10$

$x^2 - 10 = -2x^2 - 13x$

$+2x^2 + 13x \quad +2x^2 + 13x$

$3x^2 + 13x - 10 = 0$

$3x^2 + 13x - 10 = 0$

$3x^2 + 15x - 2x - 10 = 0$

$3x(x+5) - 2(x+5) = 0$

$(x+5)(3x-2) = 0$

$x + 5 = 0 \quad \text{or} \quad 3x - 2 = 0$

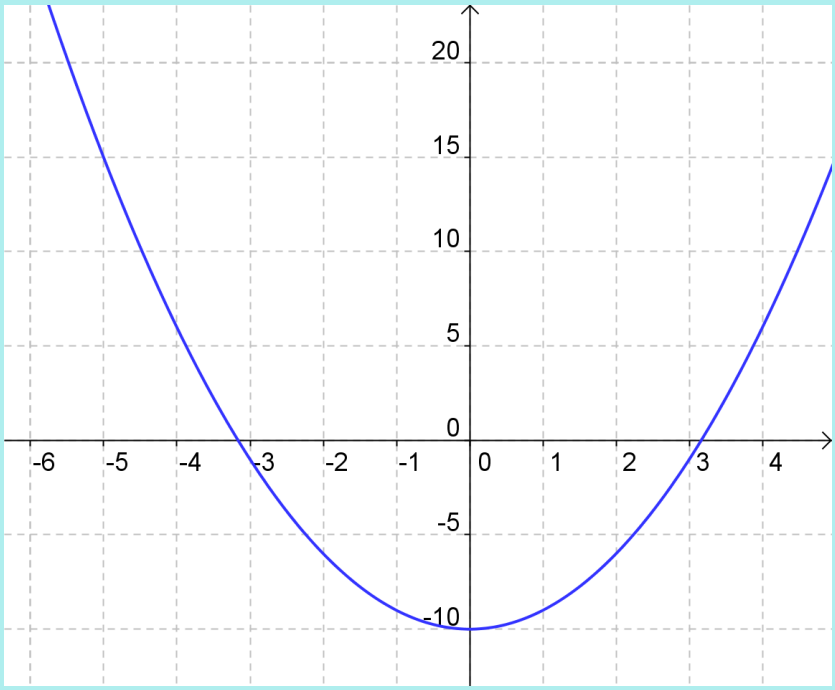
$x = -5 \qquad 3x = 2$

$x = \frac{2}{3}$

S 13
P -30
I 15, -2

Mar 29-11:52 AM

$y = x^2 - 10$



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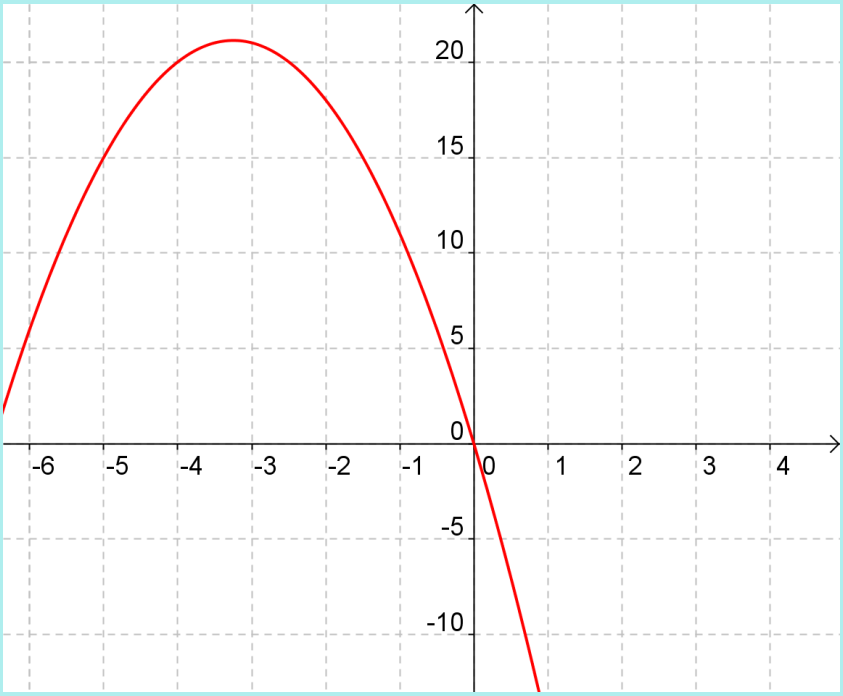
$y = -x(2x + 13)$



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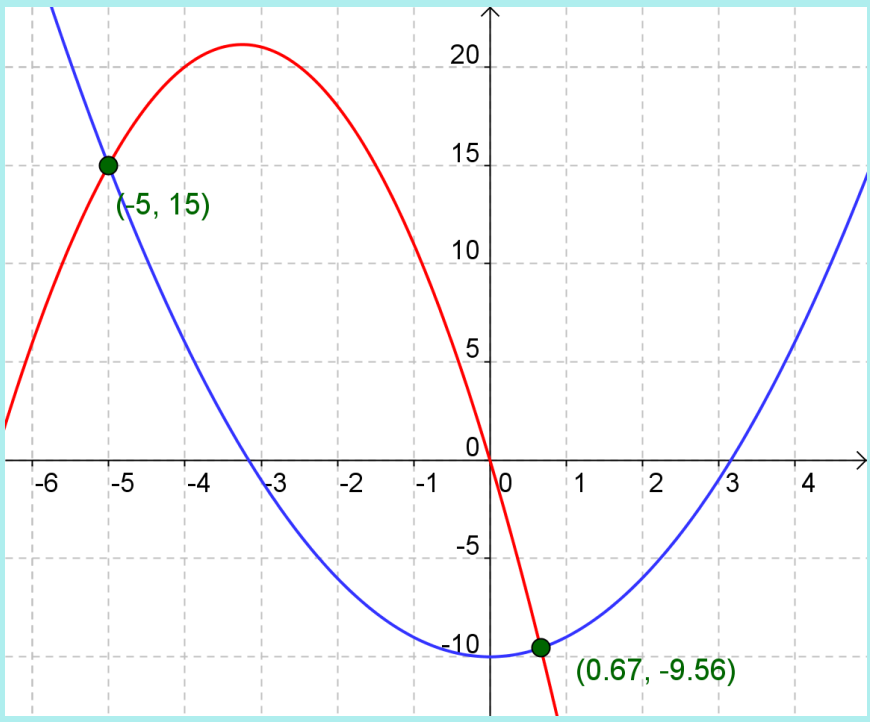
$x^2 - 10 = -x(2x + 13)$



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Assigned Work:

p.320 # 4ac, 6ace, 7ace, 9ade, 11, 14

4(c) $2x^2+11x+5=0$ $x=-\frac{1}{2}$?

$LS = 2\left(-\frac{1}{2}\right)^2+11\left(-\frac{1}{2}\right)+5$ $RS=0$

$= \cancel{2}^{1}\left(\frac{1}{\cancel{4}_{2}}\right)-\frac{11}{2}+5$ $LS=RS$

$=\frac{1}{2}-\frac{11}{2}+\frac{10}{2}$ $x=-\frac{1}{2}$ is a root.

$=0$

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

$3x^2-6x+1x-2=0$

$3x(x-2)+1(x-2)=0$

$(x-2)(3x+1)=0$

S -5
P -6
I -6, 1

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

$x=2$ $3x=-1$

$x=-\frac{1}{3}$

Apr 22-12:38 PM

11. $A = 160x + 4x^2$

what value(s) of x give A = 900?

Set $A = 900$, solve

$900 = 160x + 4x^2$

$0 = 4x^2 + 160x - 900$

$\frac{0}{4} = \frac{4(x^2 + 40x - 225)}{4}$

$0 = x^2 + 40x - 225$

S 40
P -225
I 45, -5

$0 = x^2 + 45x - 5x - 225$

$0 = x(x+45) - 5(x+45)$

$0 = (x+45)(x-5)$

$x + 45 = 0$ $\quad x - 5 = 0$

$x = -45$ $\quad x = 5$

negative width not possible

∴ the walkway should be 5m wide.

Apr 22-12:40 PM

14. $h = -5t^2 - 4t + 120$

(a) ground → $h = 0$

$\frac{0}{-1} = \frac{-5t^2}{-1} - \frac{4t}{-1} + \frac{120}{-1}$

$0 = 5t^2 + 4t - 120$

S 4
P -600
I

-24, 25
-20, 30

Apr 22-12:49 PM