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

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

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

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

$x - 8 = 0$ $\quad$ $x - 4 = 0$

$x = 8$ $\quad$ $x = 4$

check $x = 8$:

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

$= (8)^2 - 12(8) + 32$

$= 64 - 96 + 32$

$= 0$

$LS = RS$ ✓

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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) $y = 0$

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

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

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

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

S 5
P -24
I 8, -3

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

$x = -4$ $\quad$ $2x = 3$

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

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

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

: $(x, -12)$

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

$+12 \qquad +12$

$0 = 2x^2 + 5x$

$0 = x(2x+5)$

$x = 0 \qquad 2x + 5 = 0$

$2x = -5$

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

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

$y = x(2x+5) - 12$

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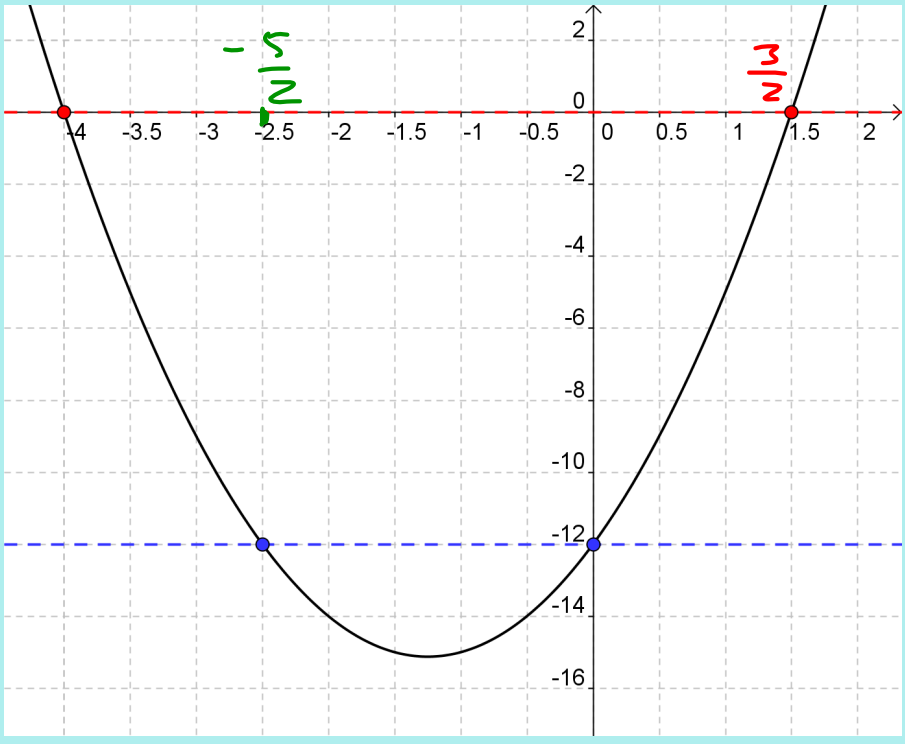
Ex.2 Solve $y = 2x^2 + 5x - 12$ for (a) $y = 0$
(b) $y = -12$



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To solve using factored form:

1) Expand all terms (no brackets)

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

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

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

$3x^2 + 15x - 2x - 10 = 0$ | $0 = 3x^2 + 13x - 10$

$3x(x+5) - 2(x+5) = 0$ S 13 P -30 I 15, -2

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

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

$x=-5$ $3x=2$

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

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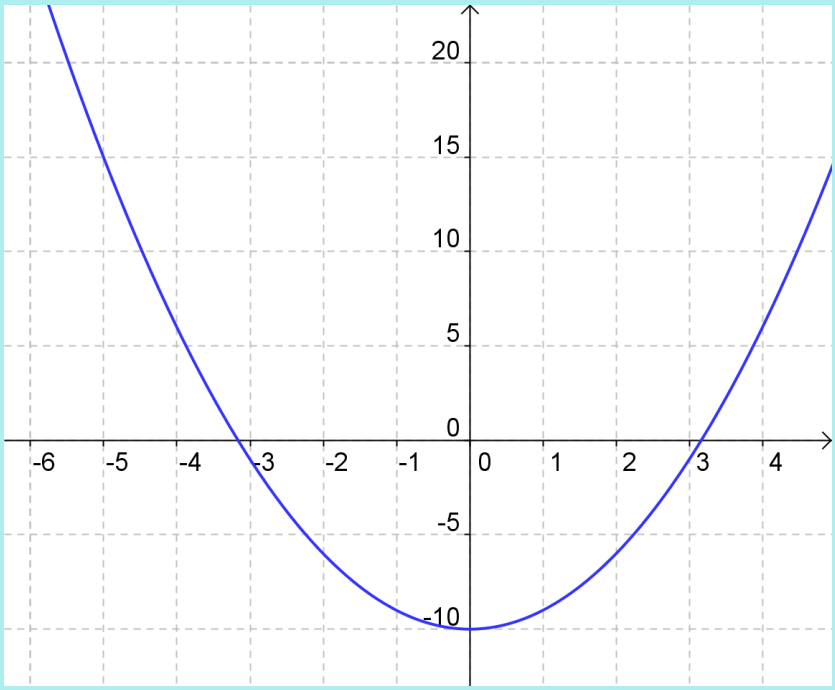
$y = x^2 - 10$



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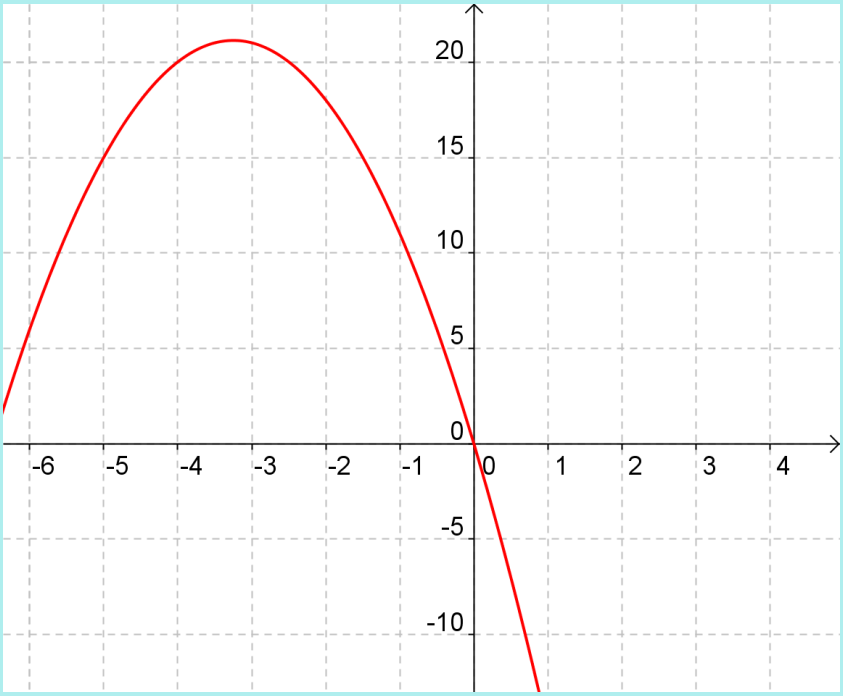
$y = -x(2x + 13)$



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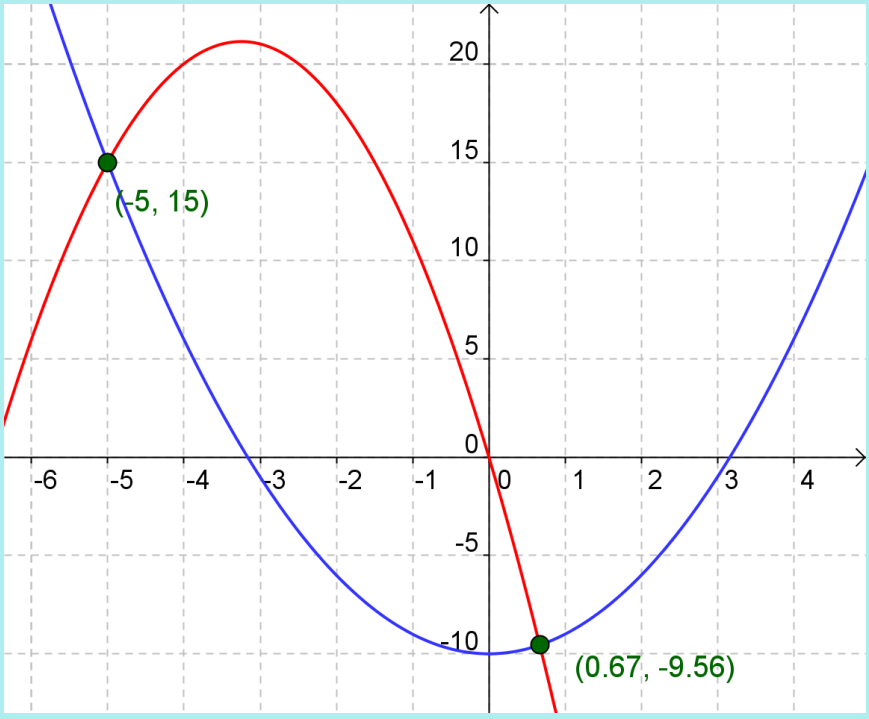
$x^2 - 10 = -x(2x + 13)$



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Assigned Work:

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

6(c) $3x^2-4x-15=0$

S -4
P -45
I $5,-9$

$3x^2+5x-9x-15=0$

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

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

$3x+5=0$ or $x-3=0$

$3x=-5$ $\quad x=3$

$x=\frac{-5}{3}$

$LS=3x^2-4x-15$

$=3\left(\frac{-5}{3}\right)^2-4\left(\frac{-5}{3}\right)-15$

$=3\left(\frac{25}{9}\right)+\frac{20}{3}-15$

$=\frac{25}{3}+\frac{20}{3}-\frac{45}{3}$

$=0$

7(c) $3x(x+2)=2x^2-1(4-x)$

$3x^2+6x=2x^2-4+x$

$x^2+5x+4=0$

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

want $A = 900$, what value of x makes this happen?

$900 = 160x + 4x^2$

$0 = 4x^2 + 160x - 900$ $[\div 4]$

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

$0 = x^2 + 40x - 225$ $\Sigma 40$ $P -225$ $I -5, 45$

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

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

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

$x - 5 = 0$ or $x + 45 = 0$

$x = 5$ $x = -45$

cannot have a negative width

∴ the width should be 5m.

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