

Solving Quadratic Equations

Nov. 23/2011

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 $x^2 - 12x + 32 = 0$ → zeroes

$$\begin{aligned}
 x^2 - 8x - 4x + 32 &= 0 & S & -12 \\
 x(x-8) - 4(x-8) &= 0 & P & 32 \\
 & & I & -8, -4 \\
 \underbrace{x(x-8)}_a - \underbrace{4(x-8)}_a &= 0 & & \\
 xa - 4a &= 0 & \frac{-4x}{-4} &= x \\
 a(x-4) &= 0 & & \\
 (x-8)(x-4) &= 0 & \frac{+32}{-4} &= -8 \\
 x-8=0 \text{ or } x-4=0 & & & \\
 \boxed{x=8} & \quad \boxed{x=4} & &
 \end{aligned}$$

check $x=8$

$$\begin{aligned}
 LS &= x^2 - 12x + 32 & RS &= 0 \\
 &= (8)^2 - 12(8) + 32 & & \\
 &= 64 - 96 + 32 & LS &= RS \checkmark \\
 &= 0 & &
 \end{aligned}$$

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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) $y = -12$

$$\begin{aligned}
 \text{(a)} \quad 0 &= 2x^2 + 5x - 12 & S & 5 \\
 0 &= 2x^2 - 3x + 8x - 12 & P & -24 \\
 & & I & -3, 8 \\
 0 &= x(2x-3) + 4(2x-3) \\
 0 &= (2x-3)(x+4) \\
 \begin{array}{l} \swarrow \quad \searrow \\ 2x-3=0 \quad x+4=0 \\ 2x=3 \quad \boxed{x=-4} \\ x=\frac{3}{2} \\ \boxed{x=1.5} \end{array} & & &
 \end{aligned}$$

these solutions/roots are the zeroes

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

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Assigned Work:

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

LS/RS
check

p.320 #6(a)

$$3x^2 - 5x - 2 = 0 \quad \begin{array}{l} S - 5 \\ P - 6 \\ I - 6, 1 \end{array}$$

$$\underbrace{3x^2 - 6x} + \underbrace{x - 2} = 0$$

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

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

$$x-2=0 \quad \text{or} \quad 3x+1=0$$

$$\boxed{x=2}$$

$$3x = -1$$

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

check $x=2$

$$\begin{array}{l} LS = 3x^2 - 5x - 2 \\ = 3(2)^2 - 5(2) - 2 \\ = 3(4) - 10 - 2 \\ = 12 - 10 - 2 \\ = 0 \end{array} \quad \begin{array}{l} RS = 0 \\ LS = RS \checkmark \end{array}$$

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9(e)

$$3x^2 + 5x - 3 = x^2 + 4x + 1$$

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

$$\begin{array}{l} S \quad 1 \\ P \quad -8 \\ I \quad ? \end{array}$$

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

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

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

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

$$x-1=0 \quad \text{or} \quad x+1=0$$

$$\boxed{x=1}$$

$$\boxed{x=-1}$$

cannot
be factored

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

$$(a) \quad \text{ground} \rightarrow h = 0$$

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

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

$$25^2 = 625$$

$$20 \times 30 = 600$$

$$[x - 1]$$

$$\begin{array}{l} S \quad 4 \\ P \quad -600 \\ H \end{array}$$

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

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

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

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

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

$$\begin{array}{l} S \quad 40 \\ P \quad -225 \\ I \quad -5, 45 \end{array}$$

$$\begin{array}{l} x - 5 = 0 \quad \text{or} \quad x + 45 = 0 \\ x = 5 \quad \quad \quad x = -45 \end{array}$$

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