Completing the Square

Video 10 on www.corbettmaths.com

Examples

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Workout

Question 1: Write the following expressions in the form $(x + a)^2 + b$

(a) $x^2 + 8x + 1$ (b) $x^2 + 10x + 3$ (c) $x^2 + 2x - 1$

(d) $x^2 - 6x - 10$ (e) $x^2 - 4x - 13$ (f) $x^2 - 12x + 3$

(g) $x^2 + 14x + 3$ (h) $x^2 - 2x - 15$ (i) $x^2 + 4x - 11$

(j) $x^2 + x - 8$ (k) $x^2 + 3x + 1$ (l) $x^2 - 7x - 2$

(m) $x^2 - 9x - 1$ (n) $x^2 + 11x + 3$ (o) $x^2 - 100x - 25$

Question 2: Solve the following equations (use completing the square).

(a) $x^2 + 4x + 1 = 0$ (b) $x^2 + 8x - 10 = 0$ (c) $x^2 + 14x - 4 = 0$

(d) $x^2 - 8x - 2 = 0$ (e) $x^2 - 10x + 10 = 0$ (f) $x^2 + 18x + 7 = 0$

(g) $x^2 + 12x + 3 = 19$ (h) $x^2 = 2x + 10$ (i) $x^2 - 7x - 3 = 0$

(j) $x^2 + x - 7 = 0$ (k) $x^2 + 3x + 8 = 0$ (l) $2x^2 - 10x - 30 = x^2 - 4x$

Question 3: Write the following expressions in the form $a(x + b)^2 + c$

(a) $2x^2 + 8x + 2$ (b) $2x^2 + 12x - 3$ (c) $3x^2 - 12x + 2$

(d) $4x^2 + 12x - 5$ (e) $2x^2 - 3x - 5$ (f) $5x^2 - 20x + 30$

Question 4: Solve the following equations (use completing the square).

(a) $3x^2 + 12x + 3 = 0$ (b) $2x^2 + 16x - 20 = 0$ (c) $3x^2 - 6x + 1 = 0$

(d) $5x^2 + 10x - 9 = 0$ (e) $2x^2 - 5x - 3 = 0$ (f) $2x^2 - 7x + 1 = 0$

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Apply

Question 1: Write $(x + 3)^2 - 4$ in the form $x^2 + bx + c$

Question 2: Write $(x - 2)^2 - 9$ in the form $x^2 + bx + c$

Question 3: Write $(x - 7)^2 + 11$ in the form $x^2 + bx + c$

Question 4: Use completing the square to find the minimum point for each graph below

(a) $y = x^2 + 10x + 12$ (b) $y = x^2 + 4x + 1$ (c) $y = x^2 + 6x + 8$

(d) $y = x^2 - 2x + 3$ (e) $y = x^2 - 6x - 3$ (f) $y = x^2 - x - 4$

(g) $y = x^2 + 9x + 1$ (h) $y = x^2 - 6x - 2$ (i) $y = x^2 + 22x + 100$

Question 5: By using completing the square to solve $ax^2 + bx + c = 0$, prove the quadratic formula.

Question 6: Can you spot any mistakes?

Solve $x^2 + 10x + 2 = 0$

$(x + 5)^2 - 10 + 2 = 0$

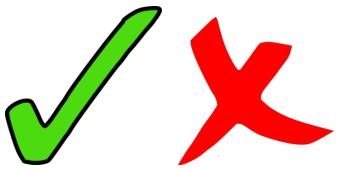
$(x + 5)^2 - 12 = 0$

$(x + 5)^2 = 12$

$x + 5 = \sqrt{12}$

$x = -5 + \sqrt{12}$

Answers



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