ALGEBRA: COMPLETING THE SQUARE & TURNING POINTS

Best Guess Mastery Worksheet (Target Grade 7/8)

I Do

(a) Express $f(x) = 2x^2 - 12x + 23$ in the form $a(x + b)^2 + c$, where a, b, and c are integers to be found.

(b) Hence, write down the coordinates of the turning point on the curve with equation $y = 2x^2 - 12x + 23$.

We Do

(a) Express $f(x) = 3x^2 - 12x + 19$ in the form $a(x + b)^2 + c$, where a, b, and c are integers to be found.

(b) Hence, write down the coordinates of the turning point on the curve with equation $y = 3x^2 - 12x + 19$.

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You Do 1

(a) Express $f(x) = 2x^2 - 16x + 35$ in the form $a(x + b)^2 + c$, where a, b, and c are integers to be found.

(b) Hence, write down the coordinates of the turning point on the curve with equation $y = 2x^2 - 16x + 35$.

You Do 2

(a) Express $f(x) = 4x^2 + 24x + 31$ in the form $a(x + b)^2 + c$, where a, b, and c are integers to be found.

(b) Hence, write down the coordinates of the turning point on the curve with equation $y = 4x^2 + 24x + 31$.

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Challenge 1

(a) Express $f(x) = -2x^2 + 16x - 27$ in the form $a(x + b)^2 + c$, where a, b, and c are integers to be found.

(b) Hence, write down the coordinates of the **maximum** turning point on the curve with equation $y = -2x^2 + 16x - 27$.

Challenge 2

(a) Express $f(x) = 2x^2 + 10x + 15$ in the form $a(x + b)^2 + c$, where a, b, and c are rational numbers to be found.

(b) Hence, write down the coordinates of the turning point on the curve with equation $y = 2x^2 + 10x + 15$.

Answers & Worked Solutions

I Do:

(a) $f(x) = 2(x^2 - 6x) + 23$

$= 2[(x - 3)^2 - 9] + 23$

$= 2(x - 3)^2 - 18 + 23$

$= \mathbf{2(x - 3)^2 + 5}$

(b) Minimum point occurs when $(x - 3) = 0$, so $x = 3$. $y = 5$.

Turning point = **(3, 5)**

We Do:

(a) $f(x) = 3(x^2 - 4x) + 19$

$= 3[(x - 2)^2 - 4] + 19$

$= 3(x - 2)^2 - 12 + 19$

$= \mathbf{3(x - 2)^2 + 7}$

(b) Turning point = **(2, 7)**

You Do 1:

(a) $f(x) = 2(x^2 - 8x) + 35$

$= 2[(x - 4)^2 - 16] + 35$

$= 2(x - 4)^2 - 32 + 35$

$= \mathbf{2(x - 4)^2 + 3}$

(b) Turning point = **(4, 3)**

You Do 2:

(a) $f(x) = 4(x^2 + 6x) + 31$

$= 4[(x + 3)^2 - 9] + 31$

$= 4(x + 3)^2 - 36 + 31$

$= \mathbf{4(x + 3)^2 - 5}$

(b) Turning point = **(−3, −5)**

Challenge 1:

(a) $f(x) = -2(x^2 - 8x) - 27$

$= -2[(x - 4)^2 - 16] - 27$

$= -2(x - 4)^2 + 32 - 27$

$= \mathbf{-2(x - 4)^2 + 5}$

(b) Maximum turning point = **(4, 5)**

Challenge 2:

(a) $f(x) = 2(x^2 + 5x) + 15$

$= 2[(x + 2.5)^2 - 6.25] + 15$

$= 2(x + 2.5)^2 - 12.5 + 15$

$= \mathbf{2(x + 2.5)^2 + 2.5}$ *or* $\mathbf{2(x + \frac{5}{2})^2 + \frac{5}{2}}$

(b) Turning point = **(−2.5, 2.5)**