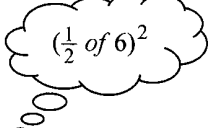


1. Convert each of the following into *vertex form* by **completing the square**.

(Use the first question as a guide)

a) $y = x^2 + 6x$



$$y + \mathbf{9} = x^2 + 6x + \mathbf{9}$$

$$y = (x + 3)^2 - 9$$

b) $y = x^2 - 10x$

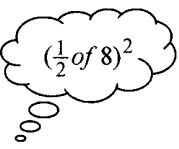
c) $y = x^2 + 18x$

This technique can be used for all questions. It will be very useful when fractions become involved.

2. Convert each of the following into *vertex form* by **completing the square**.

(Use the first question as a guide)

a) $y = x^2 + 8x - 3$



$$y + \mathbf{3} = x^2 + 8x$$

$$y + 3 + \mathbf{16} = x^2 + 8x + \mathbf{16}$$

$$y + 19 = (x + 4)^2$$

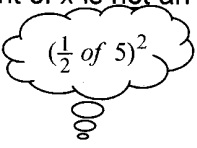
$$y = (x + 4)^2 - 19$$

b) $y = x^2 - 12x - 5$

c) $y = x^2 + 10x + 1$

3. When the coefficient of x is not an even number, the same technique is applied.

a) $y = x^2 + 5x + 2$



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

$$y - 2 + \left(\frac{\mathbf{25}}{\mathbf{4}}\right) = x^2 + 5x + \left(\frac{\mathbf{25}}{\mathbf{4}}\right)$$

$$y + \frac{\mathbf{17}}{\mathbf{4}} = \left(x + \frac{\mathbf{5}}{\mathbf{2}}\right)^2$$

$$y = \left(x + \frac{\mathbf{5}}{\mathbf{2}}\right)^2 - \frac{\mathbf{17}}{\mathbf{4}}$$

b) $y = x^2 + 7x + 1$

c) $y = x^2 - 3x - 5$

4. When the coefficient is not "1", you MUST common factor that coefficient, *even if it doesn't appear to be common.*

<p>a) $y = -x^2 - 4x + 5$ $y - 5 = -(x^2 + 4x)$ $y - 5 - \mathbf{4} = -(x^2 + 4x + \mathbf{4})$ $y - 9 = -(x + 2)^2$ $y = -(x + 2)^2 + 9$</p>	<p>b) $y = 3x^2 + 12x - 5$ $y + 5 = 3(x^2 + 4x)$ $y + 5 + \mathbf{12} = 3(x^2 + 4x + \mathbf{4})$ $y + 17 = 3(x + 2)^2$ $y = 3(x + 2)^2 - 17$</p>
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$3 \times 4 = 12$

<p>c) $y = 2x^2 + 5x - 1$ $y + 1 = 2(x^2 + \frac{5}{2}x)$ $y + 1 + \frac{\mathbf{25}}{\mathbf{8}} = 2(x^2 + \frac{5}{2}x + \frac{\mathbf{25}}{\mathbf{16}})$ $y + \frac{\mathbf{33}}{\mathbf{8}} = 2(x + \frac{5}{4})^2$ $y = 2(x + \frac{5}{4})^2 - \frac{\mathbf{33}}{\mathbf{8}}$</p>	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; margin: 0 auto;"> $2(\frac{25}{16}) = \frac{25}{8}$ </div> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; margin: 0 auto; margin-top: 20px;"> $\frac{1}{2} \text{ of } \frac{5}{2} = \frac{5}{4}$ $(\frac{5}{4})^2 = \frac{25}{16}$ </div>
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5. Without graphing each function, state whether it has a maximum or a minimum value. State the maximum or minimum value of the function. State the value of x when it occurs.

<p>a) $y = x^2 + 6x + 2$ c) $y = 2x^2 - 4x + 5$ e) $y = 4 - 6x - x^2$ g) $y = -4x^2 + 8x - 4$ i) $y = -28 + 10x - x^2$</p>	<p>b) $y = 3x^2 + 6x - 8$ d) $y = -2x^2 - 12x$ f) $y = 2x^2 + 3x + 3$ h) $y = 4x^2 - 16x$ j) $y = x^2 - 12x + 36$</p>
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Date:

Equation in standard form $y = ax^2 + bx + c$	Equation in vertex form $y = a(x - p)^2 + q$	Direction of opening	Equation of axis of symmetry	Vertex	Is vertex a minimum or a maximum point?	Minimum or maximum value	Shape of graph compared to $y = x^2$	y-intercept
$y = x^2 - 8x + 3$								
$y = -2x^2 + 12x - 12$								
$y = x^2 - 3x + 5$								
$y = 3x^2 - 12x + 5$								
	$y = 3(x - 1)^2 - 7$							
	$y = -(x - 3)^2 + 5$							

