Completing The Square

Date:

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

   (Use the first question as a guide)

   a) $y = x^2 + 6x$ $\left(\frac{1}{2} \text{ of } 6\right)^2$

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

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

   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) $y = x^2 + 8x - 3$ $\left(\frac{1}{2} \text{of } 8\right)^2$

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

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

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

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

   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) $y = x^2 + 5x + 2$ $\left(\frac{1}{2} \text{ of } 5\right)^2$

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

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

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

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

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

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

Completing the Square II

Date:

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

a) $y = -x^2 - 4x + 5$

$y - 5 = -(x^2 + 4x)$

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

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

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

b) $y = 3x^2 + 12x - 5$

$3 \times 4 = 12$

$y + 5 = 3(x^2 + 4x)$

$y + 5 + \mathbf{12} = 3(x^2 + 4x + \mathbf{4})$

$y + 17 = 3(x+2)^2$

$y = 3(x+2)^2 - 17$

c) $y = 2x^2 + 5x - 1$

$2(\frac{25}{16}) = \frac{25}{8}$

$\frac{1}{2}$ *of* $\frac{5}{2} = \frac{5}{4}$

$(\frac{5}{4})^2 = \frac{25}{16}$

$y + 1 = 2(x^2 + \frac{5}{2}x)$

$y + 1 + \mathbf{\frac{25}{8}} = 2(x^2 + \frac{5}{2}x + \mathbf{\frac{25}{16}})$

$y + \frac{33}{8} = 2(x + \frac{5}{4})^2$

$y = 2(x + \frac{5}{4})^2 - \frac{33}{8}$

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.

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

b) $y = 3x^2 + 6x - 8$

c) $y = 2x^2 - 4x + 5$

d) $y = -2x^2 - 12x$

e) $y = 4 - 6x - x^2$

f) $y = 2x^2 + 3x + 3$

g) $y = -4x^2 + 8x - 4$

h) $y = 4x^2 - 16x$

i) $y = -28 + 10x - x^2$

j) $y = x^2 - 12x + 36$

Completing the Square

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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
$y = x^2 - 8x + 3$								
$y = -2x^2 + 12x - 12$								
$y = x^2 - 3x + 5$								
$y = 3x^2 - 12x + 5$								
	$y = 3(x-1)^2 - 7$							
	$y = -(x-3)^2 + 5$							

Converting Quadratic Forms

Date: