

Completing the Square

Convert each of the following into Vertex form using Completing the Square. State the vertex and whether it is a maximum or a minimum of the graph.

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|--------------------------|---|--|
| 1. $y = x^2 + 10x + 15$ | $y = x^2 + 10x + 5^2 - 5^2 + 15$
$y = (x+5)^2 - 10$ | Vertex $(-5, -10)$
minimum |
| 2. $y = x^2 - 8x - 4$ | $y = x^2 - 8x + 4^2 - 4^2 - 4$
$y = (x-4)^2 - 20$ | Vertex $(4, -20)$
minimum |
| 3. $y = x^2 + 14x - 14$ | $y = x^2 + 14x + 7^2 - 7^2 - 14$
$y = (x+7)^2 - 63$ | Vertex $(-7, -63)$
minimum |
| 4. $y = -x^2 + 2x + 4$ | $y = -1(x^2 - 2x + 1^2 - 1^2) + 4$
$y = -1(x-1)^2 + 1 + 4$ | $y = -1(x-1)^2 + 5$
Vertex $(1, 5)$ maximum |
| 5. $y = x^2 - 6x + 17$ | $y = x^2 - 6x + 3^2 - 3^2 + 17$
$y = (x-3)^2 + 8$ | Vertex $(3, 8)$
minimum |
| 6. $y = 2x^2 + 12x + 17$ | $y = 2(x^2 + 6x + 3^2 - 3^2) + 17$
$y = 2(x+3)^2 - 18 + 17$ | $y = 2(x+3)^2 - 1$
Vertex $(-3, -1)$ minimum |
| 7. $y = 2x^2 - 20x + 22$ | $y = 2(x^2 - 10x + 5^2 - 5^2) + 22$
$y = 2(x-5)^2 - 50 + 22$ | $y = 2(x-5)^2 - 28$
Vertex $(5, -28)$ minimum |
| 8. $y = -x^2 + 4x - 10$ | $y = -1(x^2 - 4x + 2^2 - 2^2) - 10$
$y = -1(x-2)^2 + 4 - 10$ | $y = -1(x-2)^2 - 6$
Vertex $(2, -6)$ maximum |

Convert the following from Vertex form to Standard form.

9. $y = 3(x+2)^2 - 4$

10. $y = (x-7)^2 + 13$

(9) $y = 3(x+2)(x+2) - 4$
 $y = 3[x^2 + 2x + 2x + 4] - 4$
 $y = 3[x^2 + 4x + 4] - 4$
 $y = 3x^2 + 12x + 12 - 4$
 $y = 3x^2 + 12x + 8$

(10) $y = (x-7)(x-7) + 13$
 $y = x^2 - 7x - 7x + 49 + 13$
 $y = x^2 - 14x + 62$