Vertex Form by Completing the Square **Name:** _____

Example 1: $y = x^2 + 8x + 2 = 0$
$-2 \quad -2$

$x^2 + 8x + 16 = -2 + 16$

$\left(\frac{b}{2}\right)^2 = \left(\frac{8}{2}\right)^2 = 4^2$

$(x+4)^2 = 14$
$-14 \quad -14$

$y = (x+4)^2 - 14$

vertex: $(-4, -14)$

AOS: $x = -4$

Example 2: $y = x^2 - 4x + 10 = 0$
$-10 \quad -10$

$x^2 - 4x + \underline{4} = -10 + \underline{4}$

$\left(\frac{-4}{2}\right)^2 = 4$

$(x-2)^2 = -6$
$+6 \quad +6$

$y = (x-2)^2 + 6$

vertex: $(2, 6)$

AOS: $x = 2$

Example 3: $y = x^2 - 2x - 5 = 0$
$+5 \quad +5$

$x^2 - 2x + \underline{1} = 5 + \underline{1}$

$\left(\frac{-2}{2}\right)^2 = (-1)^2$

$(x-1)^2 = 6$
$-6 \quad -6$

$y = (x-1)^2 - 6$

vertex $= (1, -6)$

AOS $x = 1$

Example 4: $y = x^2 - 4x - 7 = 0$
$+7 \quad +7$

$x^2 - 4x + \underline{4} = 7 + \underline{4}$

$\left(\frac{-4}{2}\right)^2 = (-2)^2$

$(x-2)^2 = 11$
$-11 \quad -11$

$y = (x-2)^2 - 11$

vertex $(2, -11)$

AOS $x = 2$

Example 5: $y = \frac{3x^2}{3} + \frac{12x}{3} - \frac{9}{3}$

$3(x^2 + 4x - 3) = 0$
$+3 \quad +3$

$x^2 + 4x + \underline{4} = 3 + \underline{4}$

$\left(\frac{4}{2}\right)^2 = (2)^2$

$(x+2)^2 = 7$
$-7 \quad -7$

$y = 3(x+2)^2 - 7$

vertex: $(-2, -7)$

AOS: $x = -2$

Example 6: $y = \frac{4x^2}{4} + \frac{24x}{4} - \frac{8}{4}$

$a = 4$

$x^2 + 6x - 2 = 0$
$+2 \quad +2$

$x^2 + 6x + \underline{9} = 2 + \underline{9}$

$\left(\frac{6}{2}\right)^2 = (3)^2$

$(x+3)^2 = 11$
$-11 \quad -11$

$y = 4(x+3)^2 - 11$

vertex: $(-3, -11)$

AOS: $x = -3$

Rewrite the quadratic function in vertex form and identify the vertex.

16. $x^2 - 2x - 2 = 0$

$x^2-2x+\underline{1} = 2+\underline{1}$

$(-\frac{2}{2})^2=(-1)^2=1$

$(x-1)^2 = 3$

$y=(x-1)^2-3$

vertex $(1,-3)$

AOS $x=1$

17. $x^2 - 4x - 1 = 0$

$+1 \quad +1$

$x^2-4x+\underline{4} = 1+\underline{4}$

$(\frac{-4}{2})^2=(-2)^2=4$

$(x-2)^2 = 5$

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

vertex $(2,-5)$ AOS $x=2$

18. $x^2 - 6x + 2 = 0$

$-2 \quad -2$

$x^2-6x+\underline{9} = -2+\underline{9}$

$(\frac{-6}{2})^2=(-3)^2=9$

$(x-3)^2 = 7$

$y=(x-3)^2-7$

vertex $(3,-7)$

AOS $x=3$

19. $x^2 + 12x + 3 = 0$

$-3 \quad -3$

$x^2+12x+\underline{36} = -3+\underline{36}$

$(\frac{12}{2})^2=(6)^2=36$

$(x+6)^2 = 33$

$y=(x+6)^2-33$

vertex $(-6,-33)$

AOS $x=-6$

20. $x^2 + 2x - 2 = 0$

$+2 \quad +2$

$x^2+2x+\underline{1} = 2+\underline{1}$

$(\frac{2}{2})^2=(1)^2$

$(x+1)^2 = 3$

$y=(x+1)^2-3$

vertex $(-1,-3)$

AOS $x=-1$

21. $x^2 + 8x - 1 = 0$

$+1 \quad +1$

$x^2+8x+\underline{16} = 1+\underline{16}$

$(\frac{8}{2})^2=(4)^2=16$

$(x+4)^2 = 17$

$y=(x+4)^2-17$

vertex $(-4,-17)$

AOS $x=-4$

22. $x^2 - 16x + 15 = 0$

$-15 \quad -15$

$x^2-16x+\underline{64} = -15+\underline{64}$

$(\frac{-16}{2})^2=(-8)^2=64$

$(x-8)^2 = 49$

$y=(x-8)^2-49$

vertex $(8,-49)$

AOS $x=8$

23. $x^2 + x - 2 = 0$

$x^2+x+\underline{1/4} = 2+\underline{1/4}$

$(\frac{1}{2})^2=\frac{1}{4}$

$(x+\frac{1}{2})^2 = 2.25$

$y=(x+\frac{1}{2})^2-2.25$

vertex $(-\frac{1}{2},-2.25)$

AOS $x=-\frac{1}{2}$

24. $x^2 - x - 1 = 0$

$+1 \quad +1$

$x^2-x+\underline{.25} = 1+\underline{.25}$

$(\frac{-1}{2})^2=\frac{1}{4}$

$(x-.5)^2 = 1.25$

$y=(x-.5)^2-1.25$

vertex $(.5,-1.25)$

AOS $x=.5$

25. $y = x^2 + 8x + 5 = 0$

$-5 \quad -5$

$x^2+8x+\underline{16} = -5+\underline{16}$

$(\frac{8}{2})^2=(4)^2=16$

$y=(x+4)^2=11$

$y=(x+4)^2-11$

vertex $(-4,-11)$

AOS $x=-4$

26. $y = x^2 - 10x + 7 = 0$

$-7 \quad -7$

$x^2-10x+\underline{25} = -7+\underline{25}$

$(\frac{-10}{2})^2=(-5)^2=25$

$(x-5)^2 = 18$

$y=(x-5)^2-18$

vertex $(5,-18)$

AOS $x=5$

27. $y = x^2 + 2x - 3 = 0$

$+3 \quad +3$

$x^2+2x+\underline{1} = 3+\underline{1}$

$(\frac{2}{2})^2=(1)^2=1$

$(x+1)^2 = 4$

$y=(x+1)^2-4$

vertex $(-1,-4)$

AOS $x=-1$