

Quadratic Functions and Finding the Vertex

Step 1: Find the X-coordinate by using the formula $\frac{-b}{2a}$

Step 2: substitute x into original function to get y.

Ex 1: $f(x) = 2x^2 + 4x - 1$

$a = 2$ $b = 4$ $c = -1$

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

$y = 2(-1)^2 + 4(-1) - 1 = -3$

vertex $(-1, -3)$

AOS $x = -1$

Ex 2: $y = x^2 - 4x + 3$

$a = 1$ $b = -4$ $c = 3$

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

$y = (2)^2 - 4(2) + 3 = -1$

vertex $(2, -1)$

AOS $x = 2$

Ex 3: $f(x) = x^2 + 6x - 9$

$a = 1$ $b = 6$ $c = -9$

$x = \frac{-6}{2(1)} = \frac{-6}{2} = -3$

$y = (-3)^2 + 6(-3) - 9 = -18$

vertex $(-3, -18)$

AOS $x = -3$

Ex 4: $f(x) = 8x^2 + 2x - 5$

$a = 8$ $b = 2$ $c = -5$

$x = \frac{-2}{2(8)} = \frac{-2}{16} = \frac{-1}{8} = -0.125$

$y = 8(-0.125)^2 + 2(-0.125) - 5 = -5.125$

vertex $(-0.125, -5.125)$

AOS $x = -0.125$

Ex 5: $f(x) = 2x^2 + 3x - 7$

$a = 2$ $b = 3$ $c = -7$

$x = \frac{-3}{2(2)} = -0.75$

$y = 2(-0.75)^2 + 3(-0.75) - 7 = -8.125$

vertex $(-0.75, -8.125)$

AOS $x = -0.75$

Ex 6: $y = x^2 - 13x + 9$

$a = 1$ $b = -13$ $c = 9$

$x = \frac{13}{2(1)} = \frac{13}{2} = 6.5$

$y = (6.5)^2 - 13(6.5) + 9 = -33.25$

vertex $(6.5, -33.25)$

AOS $x = 6.5$

More Practice:

1. $f(x) = x^2 + 8x - 1$

$a = 1$ $b = 8$ $c = -1$

$x = \frac{-8}{2(1)} = -4$

$y = (-4)^2 + 8(-4) - 1 = -17$

vertex $(-4, -17)$

AOS $x = -4$

2. $y = 3x^2 + 6x - 10$

$a = 3$ $b = 6$ $c = -10$

$x = \frac{-6}{2(3)} = -1$

$y = 3(-1)^2 + 6(-1) - 10 = -13$

vertex $(-1, -13)$

AOS $x = -1$

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

$a = 2$ $b = -4$ $c = 9$

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

$y = 2(1)^2 - 4(1) + 9 = 7$

vertex $(1, 7)$

AOS $x = 1$

4. $f(x) = x^2 - 10x + 1$

$a = 1$ $b = -10$ $c = 1$

$x = \frac{10}{2(1)} = 5$

$y = (5)^2 - 10(5) + 1 = -24$

vertex $(5, -24)$

AOS $x = 5$

5. $y = 2x^2 - 8x + 3$

$a = 2$ $b = -8$ $c = 3$

$x = \frac{8}{2(2)} = 2$

$y = 2(2)^2 - 8(2) + 3 = -5$

vertex $(2, -5)$

AOS $x = 2$

6. $f(x) = 4x^2 + 4x - 11$

$a = 4$ $b = 4$ $c = -11$

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

$y = 4(\frac{-1}{2})^2 + 4(\frac{-1}{2}) - 11 = -12$

vertex $(\frac{-1}{2}, -12)$

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

7. $y = -2x^2 + 8x - 14$

$a = -2$ $b = 8$ $c = -14$

$x = \frac{-8}{2(-2)} = 2$

$y = -2(2)^2 + 8(2) - 14 = -6$

vertex $(2, -6)$ AOS $x = 2$

8. $f(x) = -3x^2 - 12x + 9$

$a = -3$ $b = -12$ $c = 9$

$x = \frac{12}{2(-3)} = -2$

$y = -3(-2)^2 - 12(-2) + 9 = 21$

vertex $(-2, 21)$

AOS $x = -2$