2.2 Standard Form of a Quadratic Function $y = ax^2 + bx + c$

What is the x - coordinate of the vertex of $y = ax^2 + bx + c$

$X = \frac{-b}{2a}$

$y = a(x - h)^2 + k$

Find the vertex of $f(x) = x^2 - 6x + 10$

$a = 1 \quad b = -6 \quad c = 10$

$$x = -\frac{b}{2a}$$

$$= \frac{6}{2(1)}$$

$$= \frac{6}{2} = 3$$

$$f(3) = (3)^2 - 6(3) + 10$$

$$= 9 - 18 + 10$$

$$= 1$$

$V(3, 1)$

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

$(-2,-5)$

Find the vertex of the quadratic $y = 3(x+2)^2 - 5$

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

$= 3x^2+12x+12-5$

$y = 3x^2+12x+7$

$a=3 \quad b=12 \quad c=7$

$x = \frac{-b}{2a} = \frac{-12}{2(3)} = \frac{-12}{6} = -2$

$3(-2)^2+12(-2)+7$

$12-24+7$

-5

$(-2,-5)$

Find the vertex of the quadratic $y = x^2 - 8x + 5$

2.2

16, 17

$a = 1 \quad b = -8 \quad c = 5$

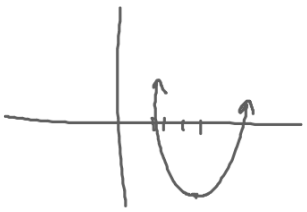
$x = \frac{-b}{2a} = \frac{8}{2(1)} = \frac{8}{2} = 4$

$y = (4)^2 - 8(4) + 5$

$16 - 32 + 5$

-11

$(4, -11)$



16. $y = -x^2 + 6x + 30$

$a = -1 \quad b = 6 \quad c = 30$

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

$-1(3)^2 + 6(3) + 30$

$-9 + 18 + 30$

$9 + 30$

39

$(3, 39)$

17. $y = 3x^2 + 12x - 5$

$a = 3 \quad b = 12$

$x = \frac{-b}{2a} = \frac{-12}{2(3)} = \frac{-12}{6}$

$= -2$

$3(-2)^2 + 12(-2) - 5$

$12 - 24 - 5$

-17

$(-2, -17)$

Find the ~~vertex~~ y-intercept

$y = x^2 + 3x$

$y = -x^2 - 12x + 15$

(0, 15)

$y = 4x^2 + 16x - 18$

(0, -18)

Find the vertex and y-intercept of the equation $y = x^2 - 4x + 8$

Vertex

$x = \frac{-b}{2a}$

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

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

$4 - 8 + 8$

4

$(2, 4)$

Y-intercept

Let $x = 0$

$y = (0)^2 - 4(0) + 8$

$0 - 0 + 8$

$(0, 8)$

Write the equation in standard form of the equation that passes through the points (-2, 32), (1, 5), and (3, 17)

$y = ax^2 + bx + c$

$32 = a(-2)^2 + b(-2) + c$

$32 = 4a - 2b + c$

$5 = a(1)^2 + b(1) + c$

$5 = a + b + c$

$17 = a(3)^2 + b(3) + c$

$17 = 9a + 3b + c$

$4a - 2b + c = 32$

$a + b + c = 5$

$9a + 3b + c = 17$

① $4a-2b+c=32$

② $a+b+c=5$

③ $9a+3b+c=17$

Eq 1 − Eq 2

$4a-2b+c=32$

$(-)\ a+b+c=5$

④ $3a-3b=27$

Eq 3 − Eq 2

$9a+3b+c=17$

$(-)\ a+b+c=5$

⑤ $8a+2b=12$

$(3a-3b=27)\times 2$

$(8a+2b=12)\times 3$

$6a-6b=54$

$(+)\ 24a+6b=36$

$30a=90$

$a=3$

$8(3)+2b=12$

$24+2b=12$

$2b=-12$

$b=-6$

$a+b+c=5$

$3-6+c=5$

$-3+c=5$

$c=8$

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

Write the equation in standard form of the equation that passes through the points (-3, 47), (-1, 9), and (2, 12)

$y = ax^2 + bx + c$

$47 = 9a - 3b + c$

$9 = a - b + c$

$12 = 4a + 2b + c$

$8a - 2b = 38$

$2(a + b = 1)$

$8a - 2b = 38$

$2a + 2b = 2$

$10a = 40$

$a = 4$

$9a - 3b + c = 47$

$(-)\ a - b + c = 9$

(4) $8a - 2b = 38$

$4a + 2b + c = 12$

$(-)\ a - b + c = 9$

(5) $3a + 3b = 3 \Rightarrow a + b = 1$

$4 + b = 1$

$b = -3$

$a - b + c = 9$

$4 - (-3) + c = 9$

$4 + 3 + c = 9$

$7 + c = 9$

$c = 2$

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