# Sec. 4.2 Standard Form of a Quadratic Function

Standard Form: $f(x) = ax^2 + bx + c$ (where $a \neq 0$)

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

Problem 1:
What are the vertex, axis of symmetry, maximum or minimum value, and range of:

a. $y = -x^2 + 6x + 3$ ($a=-1$, $b=6$, $c=3$) $= -(3)^2 + 6(3) + 3$

$-9 + 18 + 3$

$9 + 3$

$12$

vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$ $(3, 12)$

axis of symmetry: $x = \frac{-b}{2a} = \frac{-6}{2(-1)} = \frac{-6}{-2} = 3$ $\boxed{x=3}$

$\boxed{\frac{-b}{2a}}$

maximum 12

range: $y \leq 12$ If $a>0$, minimum

range: $y \geq f\left(\frac{-b}{2a}\right)$

If $a<0$ maximum

range: $y \leq f\left(\frac{-b}{2a}\right)$

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of the verte

y-intercept: $c$

$(0, c)$

b. $y = 4x^2 - 16x + 10$

$a=4 \quad b=-16 \quad c=10$

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

aos: $x = \frac{-b}{2a} = \frac{16}{2(4)} = \frac{16}{8} = 2$ $\boxed{x=2}$

vertex: $y = 4(2)^2 - 16(2) + 10$ $(2, -6)$

$4 \cdot 4 - 32 + 10$

$16 - 32 + 10$

$-16 + 10$

$-6$

max or min: ∪ min: $-6$

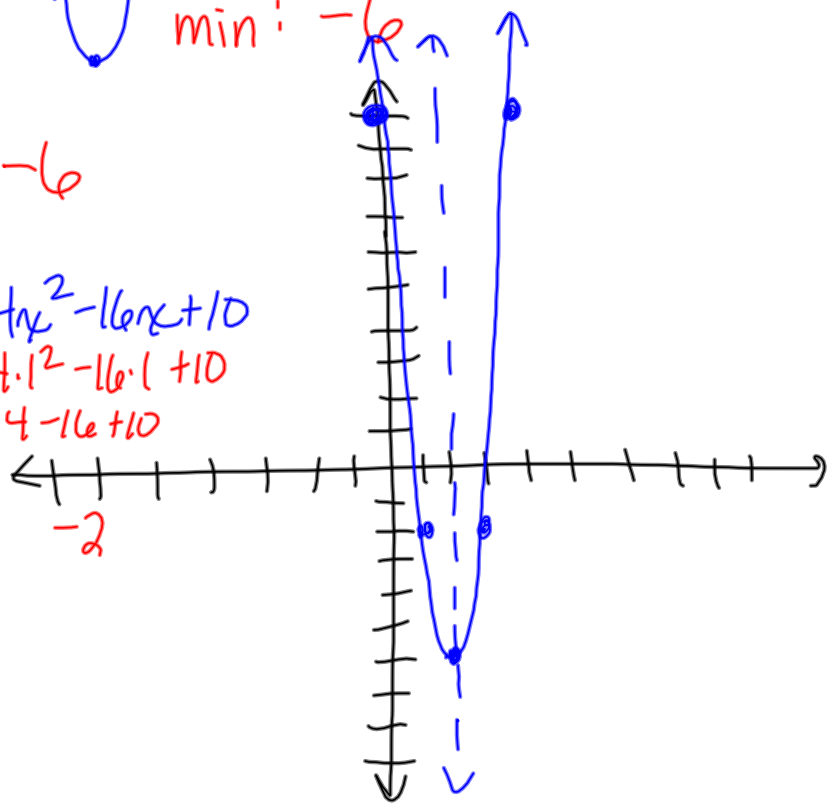
range: $y \geq -6$

$y = 4x^2 - 16x + 10$

$4 \cdot 1^2 - 16 \cdot 1 + 10$

$4 - 16 + 10$

| x | y |
|---|---|
| 0 | c |
| 0 | 10 |
| 1 | -2 |



Problem 2:

What is the vertex form of

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

vertex: $-\frac{b}{2a} = \left(\frac{3}{4}, \frac{7}{8}\right)$ ($h = \frac{3}{4}$, $k = \frac{7}{8}$)

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

$y = 2\left(x - \frac{3}{4}\right)^2 + \frac{7}{8}$

$y = 2\left(\frac{3}{4}\right)^2 - 3\left(\frac{3}{4}\right) + 2$

$\frac{2}{1} \cdot \frac{9}{16} - \frac{9}{4} \cdot \frac{2}{2} + \frac{2}{1} \cdot \frac{8}{8}$

$\frac{9}{8} - \frac{18}{8} + \frac{16}{8}$

$-\frac{9}{8} + \frac{16}{8}$

$\frac{7}{8}$