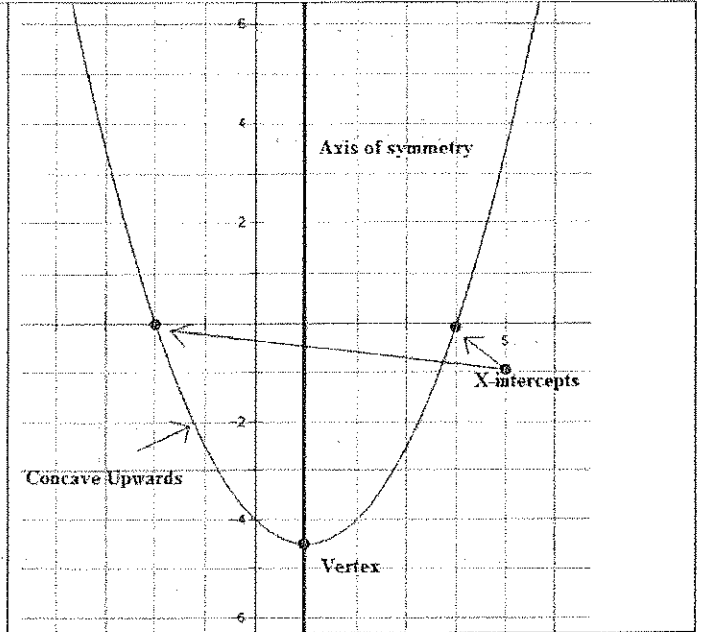


key.

Quadratic Function: $y = ax^2 + bx + c$ where $a \neq 0$

- Standard form: $y = ax^2 + bx + c$
 If $a > 0$, then the graph is concave upwards.
 If $a < 0$, then the graph is concave downwards.
 $x = \frac{-b}{2a}$ is the axis of symmetry
- Factored form: $y = a(x - r_1)(x - r_2)$
 r_1 and r_2 are x-intercepts.
- Vertex form: $y = a(x - h)^2 + k$
 (h, k) is the vertex of the graph.
 $x = h$ is the axis of symmetry



Example) Given $f(x) = -3x^2 + 4x - 1 = -(3x^2 - 4x + 1)$

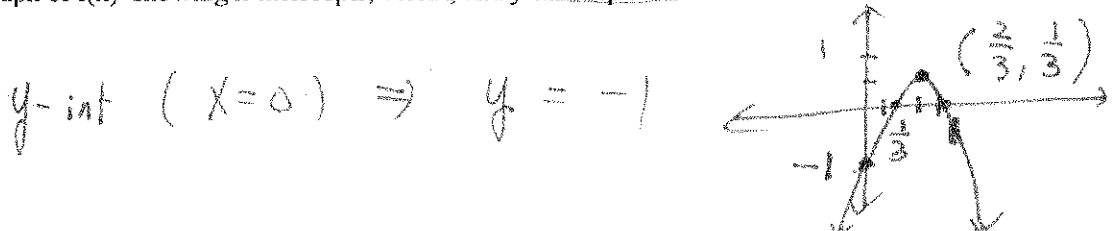
a) Write $f(x)$ in factored form and identify the x-intercepts.

$$f(x) = -(3x - 1)(x - 1) \quad \text{X-intercepts: } \left(\frac{1}{3}, 0\right) \text{ and } (1, 0)$$

b) Write $f(x)$ in vertex form by completing the square. And state the coordinates of the vertex and the axis of symmetry.

$$\begin{aligned} f(x) &= -3x^2 + 4x - 1 \\ &= -3 \left[x^2 - \frac{4}{3}x + \left(\frac{-4}{3 \cdot 2}\right)^2 \right] - 1 - \left(\frac{-4}{3 \cdot 2}\right)^2 (-3) \\ &= -3 \left(x - \frac{2}{3} \right)^2 + \frac{1}{3} \quad -1 + 3 \cdot \frac{4}{9} \\ &\quad \left(\text{Vertex } \left(\frac{2}{3}, \frac{1}{3} \right) \right) \quad \left(\text{Axis of Symm: } x = \frac{2}{3} \right) \quad -1 + \frac{4}{3} = \frac{1}{3} \end{aligned}$$

c) Sketch the graph of $f(x)$ - showing x-intercepts, vertex, and y-intercept.



Practice) Given $f(x) = 2x^2 - 5x + 2$

a) Write $f(x)$ in factored form and identify the x-intercepts.

$$f(x) = (2x - 1)(x - 2)$$

x-intercepts: $(\frac{1}{2}, 0)$ $(2, 0)$

b) Write $f(x)$ in vertex form by completing the square. And state the coordinates of the vertex and the axis of symmetry.

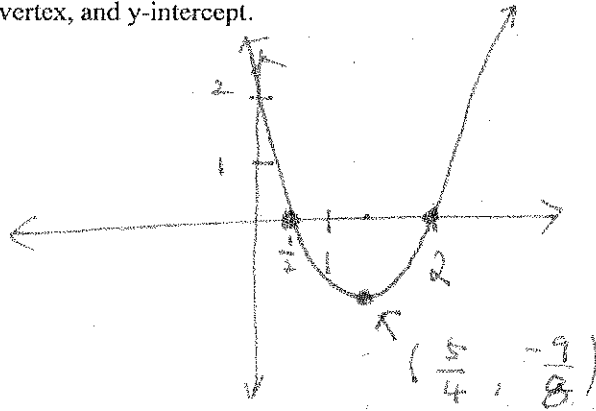
$$f(x) = 2(x^2 - \frac{5}{2}x + (\frac{5}{4})^2) + 2 - (\frac{5}{4})^2 \cdot 2$$

$$= 2(x - \frac{5}{4})^2 - \frac{9}{8}$$

Vertex: $(\frac{5}{4}, -\frac{9}{8})$ Axis of Sym: $x = \frac{5}{4}$





c) Sketch the graph of $f(x)$ showing x-intercepts, vertex, and y-intercept.

y-int: 2



Discriminant and the graphs

How many times does the graph of $y = ax^2 + bx + c$ (where $a \neq 0$) intersect with axis?

If $b^2 - 4ac = 0$		
If $b^2 - 4ac > 0$		
If $b^2 - 4ac < 0$	