

Funções do Segundo Grau

Função Quadrática:

- * $f(x) = a \cdot x^2 + b \cdot x + c, a \neq 0$
- * $D(f) = \mathbb{R}$

a) $f(x) = x^2 - 6x + 5$; $a=1, b=-6, c=5$

• Intercepta y $(0, c) = (0, 5)$

Raízes $\Delta = b^2 - 4 \cdot a \cdot c = (-6)^2 - 4 \cdot 1 \cdot 5 = 36 - 20 = 16$

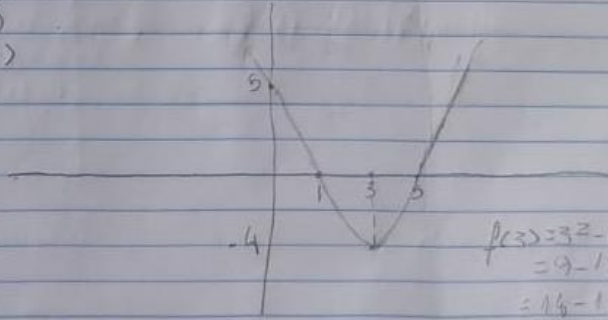
$$x = \frac{-b \pm \sqrt{\Delta}}{2 \cdot a} = \frac{-(-6) \pm \sqrt{16}}{2 \cdot 1} = \frac{6 \pm 4}{2}$$

$x_1 = \frac{6+4}{2} = \frac{10}{2} = 5$
 $x_2 = \frac{6-4}{2} = \frac{2}{2} = 1$

Vértice $V(x_v, y_v) = (3, -4)$

$$x_v = \frac{-b}{2 \cdot a} = \frac{-(-6)}{2 \cdot 1} = \frac{6}{2} = 3$$
$$y_v = \frac{-\Delta}{4 \cdot a} = \frac{-16}{4 \cdot 1} = \frac{-16}{4} = -4$$

$(0, 5)$
 $(1, 0)$
 $(5, 0)$
 $(3, -4)$



$f(3) = 3^2 - 6 \cdot 3 + 5$
 $= 9 - 18 + 5 =$
 $= 15 - 18 = -4$

b) $f(x) = x^2 - 2x + 3$ $a=1; b=-2; c=3$ - intercepta y $(0, 3)$

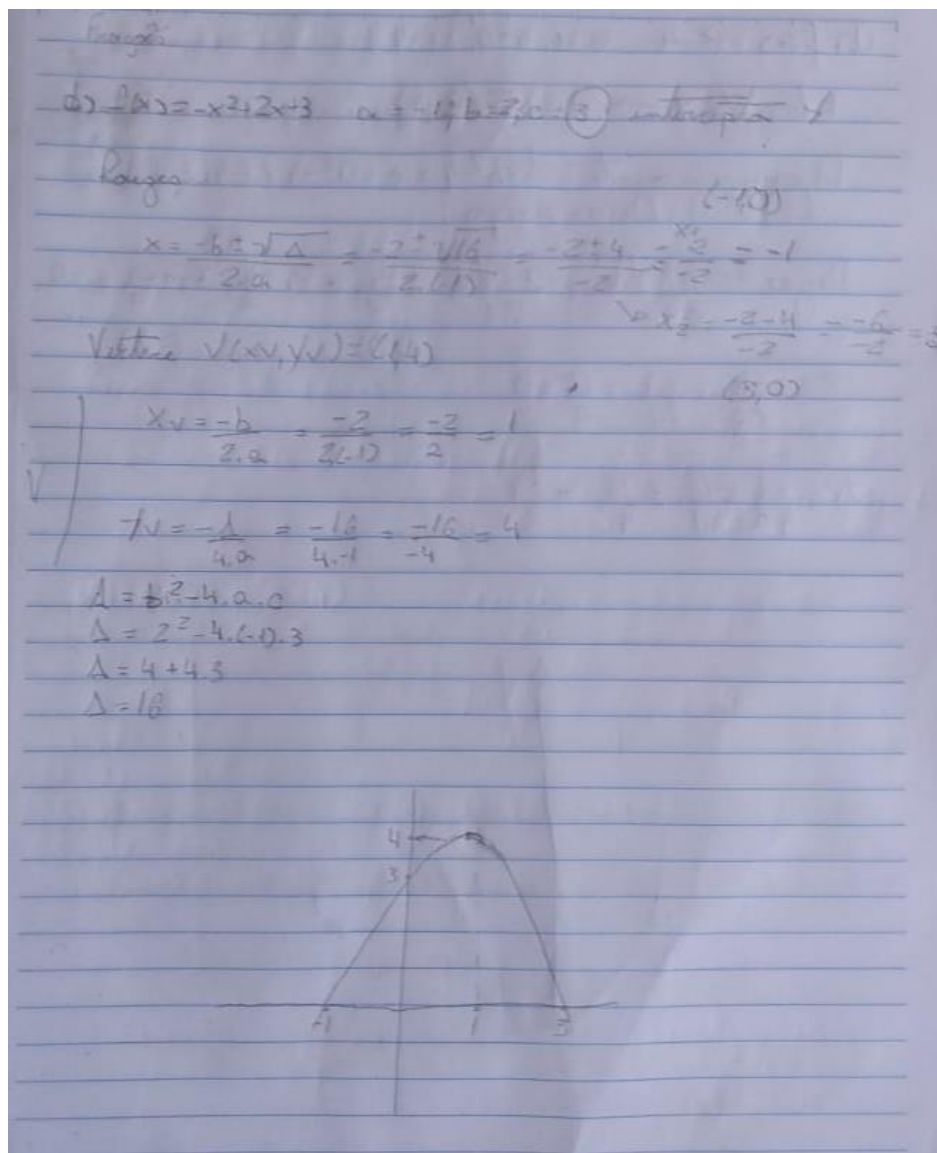
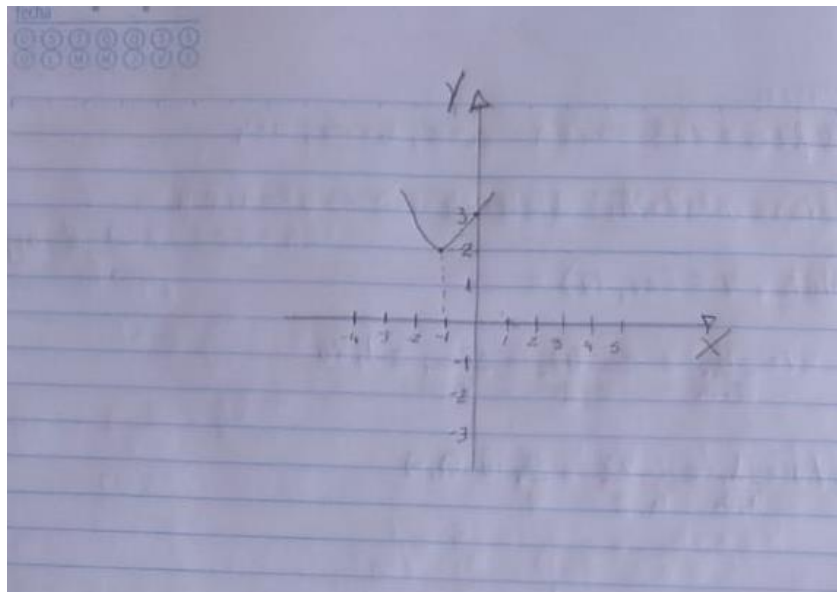
Discriminante: $\Delta = b^2 - 4 \cdot a \cdot c = (-2)^2 - 4 \cdot 1 \cdot 3 = 4 - 12 = -8$

Não há raízes reais.

$$x_v = \frac{-b}{2 \cdot a} = \frac{-(-2)}{2 \cdot 1} = \frac{2}{2} = 1$$

Vértice $V = (-1, 2)$

$$y_v = \frac{-\Delta}{4 \cdot a} = \frac{8}{4 \cdot 1} = \frac{8}{4} = 2$$



$$d) p(x) = x^2 - 4 \quad a=1, b=0, c=-4$$

$$\text{Intercepta } x \rightarrow (0, p) = (0, -4)$$

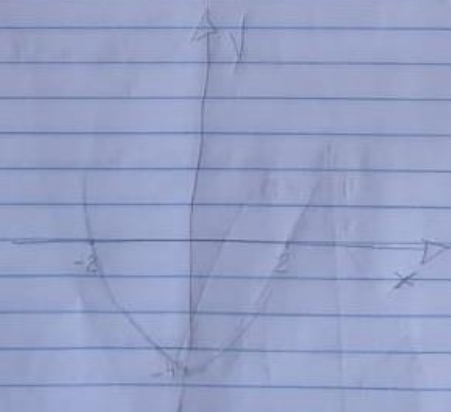
$$\text{Discriminante: } \Delta = b^2 - 4ac = 0^2 - 4(1)(-4) = 16$$

$$\Delta = +16 > 0 \text{ (Duas raízes)}$$

$$\text{Raízes } x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{0 \pm \sqrt{16}}{2 \cdot 1} = \frac{\pm 4}{2} \Rightarrow x_1 = \frac{4}{2} = 2, x_2 = \frac{-4}{2} = -2$$

$$x_v = \frac{-b}{2a} = \frac{-0}{2 \cdot 1} = \frac{0}{2} = 0$$

$$y_v = \frac{-\Delta}{4a} = \frac{-16}{4 \cdot 1} = \frac{-16}{4} = -4$$



$$e) f(x) = -x^2 + 4x; a = -1, b = 4, c = 0$$

$$(0,0)$$

$$\Delta = b^2 - 4 \cdot a \cdot c = 4^2 - 4 \cdot (-1) \cdot 0 = 16$$

$$\text{Raízes: } x = \frac{-b \pm \sqrt{\Delta}}{2 \cdot a} = x = \frac{-4 \pm \sqrt{16}}{2 \cdot (-1)} = \frac{-4 \pm 4}{-2} = \frac{-4+4}{-2} = 0 \quad \vee \quad \frac{-4-4}{-2}$$

$$\rightarrow \frac{-8}{-2} = 4$$

$$V(2,4)$$

$$\text{Verificação: } x_v = \frac{-b}{2 \cdot a} = \frac{-4}{2 \cdot (-1)} = \frac{-4}{-2} = 2$$

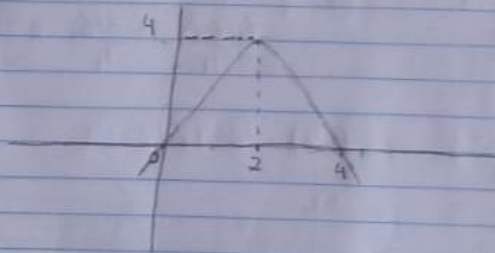
$$y_v = \frac{-\Delta}{4 \cdot a} = \frac{-16}{4 \cdot (-1)} = \frac{-16}{-4} = 4$$

$$(0,0)$$

$$(0,4)$$

$$(2,4)$$

$$(4,0)$$



PD $f(x) = 2x^2 - 5x + 1$ $a=2; b=-5; c=1$

Discriminate: $\Delta = b^2 - 4ac = -5^2 - 4 \cdot 2 \cdot 1$

$-25 - 8 = -33$ Imaginary
real

Vertex $V = (x_v, y_v) =$

$x_v = \frac{-b}{2a} = \frac{-(-5)}{2 \cdot 2} = \frac{5}{4} = 1,25$

$y_v = \frac{-\Delta}{4a} = \frac{-(-33)}{4 \cdot 2} = \frac{33}{8} = 4,125$

