

1. Find the points on the graph of  $y^2 = x^3 - 3x + 1$  where the tangent line is horizontal.  $m = 0$

$$2y \cdot \frac{dy}{dx} = 3x^2 - 3$$
$$\frac{dy}{dx} = \frac{3x^2 - 3}{2y} = 0$$

$$3x^2 - 3 = 0$$
$$x^2 = 1$$
$$x = \pm 1$$

$$\underline{x=1} : y^2 = 1^3 - 3(1) + 1$$
$$y^2 = -1$$

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$$\underline{x=-1} : y^2 = (-1)^3 - 3(-1) + 1$$
$$y^2 = 3$$
$$y = \pm\sqrt{3}$$

$$\boxed{(-1, \sqrt{3}) \quad (-1, -\sqrt{3})}$$

2. Find  $y''$  of  $y^3 - \frac{3}{2}x^2 = 1$ .

$$3y^2 \cdot \frac{dy}{dx} - 3x = 0$$

$$\frac{dy}{dx} = \frac{3x}{3y^2} = \frac{x}{y^2}$$

$$y'' = \frac{d^2y}{dx^2} = \frac{y^2 \cdot 1 - x \cdot 2y \frac{dy}{dx}}{y^4}$$

$$= \frac{y^2 - 2xy \left(\frac{x}{y^2}\right)}{y^4}$$

$$= \frac{y^2 - \frac{2x^2}{y}}{y^4} \cdot \frac{y}{y} = \boxed{\frac{y^3 - 2x^2}{y^5}}$$