Nome: Felipe Archanjo da Cunha Mendes
nº: 2252740

Lista Derivação Implícita

① a) $x^3 + y^3 = 5$

$$\frac{d(x^3+y^3)}{dx} = \frac{d(5)}{dx}$$

$$\frac{d(x^3)}{dx} + \frac{d(y^3)}{dx} = 0$$

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

$$\frac{dy}{dx} = \frac{-3x^2}{3y^2} \therefore \boxed{\frac{dy}{dx} = \frac{-x^2}{y^2}} \quad //$$

b) $xy^2 + 2x^3 = x - 2y$

$$\frac{d(xy^2)}{dx} + \frac{2d(x^3)}{dx} = \frac{dx}{dx} - \frac{2dy}{dx}$$

$$\frac{dx}{dx}\cdot y^2 + x\cdot\frac{d(y^2)}{dx} + 2\frac{d(x^3)}{dx} = 1 - 2\frac{dy}{dx}$$

$$y^2 + x\cdot 2y\cdot\frac{dy}{dx} + 6x^2 = 1 - 2\frac{dy}{dx}$$

$$2xy\frac{dy}{dx} + 2\frac{dy}{dx} = 1 - 6x^2 - y^2$$

$$\frac{dy}{dx}\left(2xy + 2\right) = 1 - 6x^2 - y^2$$

$$\boxed{\frac{dy}{dx} = \frac{1 - 6x^2 - y^2}{2(xy+1)}} \quad //$$

c) $x^2y^2 + x\,\text{sen}\,y = 0$

$$\frac{d(x^2y^2)}{dx} + \frac{d(x\cdot \text{sen}\,y)}{dx} = \frac{d(0)}{dx}$$

$$\left(\frac{d(x^2)}{dx}\cdot y^2 + x^2\cdot\frac{d(y^2)}{dx}\right) + \left(\frac{dx}{dx}\cdot \text{sen}\,y + x\cdot\frac{d(\text{sen}\,y)}{dx}\right) = 0$$

$$2x\cdot y^2 + x^2\cdot 2y\frac{dy}{dx} + 1\cdot \text{sen}\,y + x\cdot\cos y\cdot\frac{dy}{dx} = 0$$

$$2xy^2 + 2x^2y\cdot\frac{dy}{dx} + \text{sen}\,y + x\cdot\cos y\frac{dy}{dx} = 0$$

$$2x^2y\cdot\frac{dy}{dx} + x\cos y\frac{dy}{dx} = -(2xy^2 + \text{sen}\,y)$$

$$\frac{dy}{dx}\left(2x^2y + x\cos y\right) = -(2xy^2 + \text{sen}\,y)$$

$$\boxed{\frac{dy}{dx} = \frac{-(2xy^2 + \text{sen}\,y)}{2x^2y + x\cos y}} \quad //$$

d) $\sqrt{x} + \sqrt{y} = \sqrt{a}$

$x^{1/2} + y^{1/2} = a^{1/2}$

$$\frac{d(x^{1/2} + y^{1/2})}{dx} = \frac{d\,a^{1/2}}{dx}$$

$$\frac{d(x^{1/2})}{dx} + \frac{d(y^{1/2})}{dx} = 0$$

$$\frac{1}{2}x^{-1/2} + \frac{1}{2} \cdot y^{1/2} \cdot \frac{dy}{dx} = 0$$

$$\frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{y}} \cdot \frac{dy}{dx} = 0$$

$$\frac{1}{2\sqrt{y}} \frac{dy}{dx} = -\frac{1}{2\sqrt{x}}$$

$$\frac{dy}{dx} = -\frac{\cancel{2}\sqrt{y}}{\cancel{2}\sqrt{x}}$$

$$\boxed{\frac{dy}{dx} = -\frac{\sqrt{y}}{\sqrt{x}}}$$

//

e) $a\cos^2(x+y) = b$

$$a \cdot \frac{d(\cos^2(x+y))}{dx} = \frac{d(b)}{dx}$$

$$a \cdot 2\cos(x+y) \cdot \frac{d(\cos(x+y))}{dx} = 0$$

$$2a\cos(x+y) \cdot \left[-\mathrm{sen}(x+y) \cdot \frac{d(x+y)}{dx}\right] = 0$$

$$-2a\cos(x+y) \cdot \mathrm{sen}(x+y) \left[1 + \frac{dy}{dx}\right] = 0$$

$$1 + \frac{dy}{dx} = 0 \therefore \boxed{\frac{dy}{dx} = -1} \quad //$$

f) $e^y = x + y$

$$\frac{d(e^y)}{dx} = \frac{dx}{dx}^{\to 1} + \frac{dy}{d\cancel{x}}$$

$$e^y \cdot \frac{dy}{dx} = 1 + \frac{dy}{dx}$$

$$\frac{dy}{dx}(e^y - 1) = 1$$

$$\boxed{\frac{dy}{dx} = \frac{1}{e^y - 1}} \quad //$$