Find dy/dx → USE IMPLICIT DIFFERENTIATION

① $\frac{d}{dx}\left(x^4 + y^4 = 1\right)$

$$4x^3 + 4y^3 \cdot \frac{dy}{dx} = 0$$

CHAIN RULE

$$4y^3 \, dy/dx = -4x^3$$

$$dy/dx = \frac{-4x^3}{4y^3} = \boxed{-\frac{x^3}{y^3}}$$

① TAKE $\frac{d}{dx}$ OF EVERYTHING (BOTH SIDES)

② SOLVE FOR dy/dx

② $\frac{d}{dx}\left(2x^2+y^2=25\right)$

FIND THE SLOPE OF TANGENT AT $(0,5)$

$$4x+2y\frac{dy}{dx}=0$$

$$2y\frac{dy}{dx}=-4x$$

$$\frac{dy}{dx}=\frac{-4x}{2y}$$

$$\frac{dy}{dx}=\frac{-2x}{y}\Big|_{(0,5)}=\frac{0}{5}=\boxed{0}$$

→ TANGENT LINE IS HORIZONTAL AT $(0,5)$

③ $\frac{d}{dx}\left(4x^2y^3 + y = 10\right)$

PRODUCT RULE

$$4x^2 \cdot 3y^2 \cdot \frac{dy}{dx} + 8x \cdot y^3 + \frac{dy}{dx} = 0$$

$$12x^2y^2\frac{dy}{dx} + \frac{dy}{dx} = -8xy^3$$

$$\frac{dy}{dx}\left(12x^2y^2 + 1\right) = -8xy^3$$

$$\frac{dy}{dx} = \boxed{\frac{-8xy^3}{12x^2y^2 + 1}}$$

FIND SLOPE OF TANGENT LINE AT $\left(\frac{3}{2}, 1\right)$

$$\left.\frac{dy}{dx}\right|_{(3/2,1)} = \frac{-8\left(\frac{3}{2}\right)(1)}{12\left(\frac{9}{4}\right)(1) + 1}$$

$$= \frac{-12}{28}$$

$$= \boxed{\frac{-3}{7}}$$

④ TAKE THE DERIVATIVE W/ RESPECT TO t :

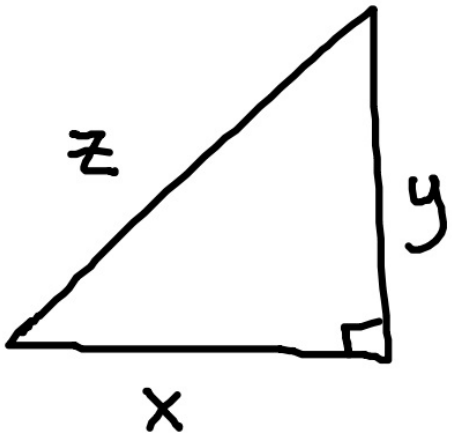
$$\frac{d}{dt}\left(x^2+y^2=z^2\right)$$

$$2x\cdot\frac{dx}{dt}+2y\frac{dy}{dt}=2z\frac{dz}{dt}$$

$\frac{dx}{dt}$ ↓ INSTANTANEOUS RATE OF CHANGE OF x

$\frac{dy}{dt}$ ↓ R.O.C OF y

$\frac{dz}{dt}$ ↓ R.O.C. OF z



(5) $\frac{d}{dx}(x\cos(y) = y)$ Find dy/dx

$$x \cdot -\sin(y)\frac{dy}{dx} + \cos y = \frac{dy}{dx}$$

$$\cos y = \frac{dy}{dx} + x\sin y \frac{dy}{dx}$$

$$\cos y = \frac{dy}{dx}(1 + x\sin y)$$

$$\boxed{\frac{\cos y}{1 + x\sin y} = \frac{dy}{dx}}$$