

Implicit Differentiation

Differentiate with respect to x : $y = (x^2+1)(x^3+2)(x^4+3)(x^5+4)$

$$\ln y = \ln(x^2+1)(x^3+2)(x^4+3)(x^5+4)$$

$$\ln y = \ln(x^2+1) + \ln(x^3+2) + \ln(x^4+3) + \ln(x^5+4)$$

A Log Rule:

$$\ln(ab) = \ln(a) + \ln(b)$$

$$\left(\frac{1}{y}\right)y' = \left(\frac{1}{x^2+1}\right)\left(\frac{d}{dx}x^2+1\right) + \left(\frac{1}{x^3+2}\right)\left(\frac{d}{dx}x^3+2\right) + \left(\frac{1}{x^4+3}\right)\left(\frac{d}{dx}x^4+3\right) + \left(\frac{1}{x^5+4}\right)\left(\frac{d}{dx}x^5+4\right)$$

$$\left(\frac{1}{y}\right)y' = \frac{2x}{x^2+1} + \frac{3x^2}{x^3+2} + \frac{4x^3}{x^4+3} + \frac{5x^4}{x^5+4}$$

$$y' = \left(\frac{2x}{x^2+1} + \frac{3x^2}{x^3+2} + \frac{4x^3}{x^4+3} + \frac{5x^4}{x^5+4}\right) \left((x^2+1)(x^3+2)(x^4+3)(x^5+4)\right)$$

No need to simplify!!