Ex 1: Find the derivative

$$y = \ln\left(\frac{x(x^2+1)^2}{\sqrt{2x^3-1}}\right)$$

$$y = \ln\left(x(x^2+1)^2\right) - \ln\left(\sqrt{2x^3-1}\right)$$

$$y = \ln(x) + \ln(x^2+1)^2 - \ln(2x^3-1)^{\frac{1}{2}}$$

$$y = \ln(x) + 2\ln(x^2+1) - \frac{1}{2}\ln(2x^3-1)$$

$$y' = \frac{1}{x} + \frac{4x}{x^2+1} - \frac{3x^2}{2x^3-1}$$

$$y' = \frac{7x^5 - x^3 - 5x^2 - 1}{2x^6 + 2x^4 - x^3 - x}$$

restrictions? $x > 0$

$x \neq \sqrt[3]{\frac{1}{2}}$

Ex 2: Find the derivative

(a) $y = \dfrac{(x-2)^2}{\sqrt{x^2+1}}$ use logarithmic differentiation

$$\ln y = \ln\left(\frac{(x-2)^2}{\sqrt{x^2+1}}\right)$$

$$\ln y = 2\ln(x-2) - \frac{1}{2}\ln(x^2+1)$$

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

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

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

$$\frac{dy}{dx} = \frac{x^3\sqrt{x^2+1} - 2x\sqrt{x^2+1} - 4\sqrt{x^2+1}}{x^4 + 2x^2 + 1} \qquad x \neq 2$$

(b) $y = x^x$ does not fit

$$\ln y = \ln x^x$$

$$\ln y = x \ln x$$

$$\frac{1}{y}\frac{dy}{dx} = x\left(\frac{1}{x}\right)(1) + (\ln x)(1)$$

(4) $$\left(\frac{1}{y}\right)\frac{dy}{dx} = (1 + \ln x)\, y$$

$$\frac{dy}{dx} = x^x + x^x \ln x \; ; \; x > 0$$

Ex 3: p177 Ex 8

(a) $$P(0) = \frac{(100)}{(1 + e^{3-0})}$$

4 students were initially infected with the flu

(b) $P(t) = \frac{100}{1+e^{3-t}}$ OR $= 100(1+e^{3-t})^{-1}$

The flu in day 3 is spreading @ a rate 25 students/day

(c) On day 3 flu is spreading @ its fastest rate of 25 students/day

Practice

DM

HW: finish DM &
p179 #43-55 odds
Skip #49