4.4 Day 2

Thursday, September 26, 2019 8:16 AM

Exp & Log Derivatives

Question: T or F

if $y = x^x$ then $y' = x \cdot x^{x-1}$ FALSE!!!!

power rule $y = x^n$ where n = constant

$y' = n \cdot x^{n-1}$

if $y = x^x$ then $y' = x^x \cdot \ln x \cdot 1$ FALSE!!

not exponential

$y = a^x$ if a = constant

$y' = a^x \cdot \ln a \cdot 1$

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hmmm... how can we find y'

if $y = x^{x^x}$

$\ln y = \ln x^x$

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

$\frac{1}{y} \cdot y' = x \cdot \frac{1}{x} + \ln x (1)$

$\frac{1}{y} y' = 1 + \ln x$

$y' = y(1 + \ln x)$

$$y' = x^x(1 + \ln x)$$

Find $\frac{dy}{dx}$ of $y = (\sin x)^x$

Find $\frac{dy}{dx}$ of $y = (\sin x)^x$

$\ln y = x \cdot (\ln(\sin x))$

$\frac{1}{y} \cdot y' = x \cdot \frac{1}{\sin x}(\cos x) + \ln(\sin x) \cdot 1$

$\frac{1}{y} y' = x \cot x + \ln(\sin x)$

$y' = y(x \cot x + \ln(\sin x))$

$\frac{dy}{dx} = (\sin x)^x (x \cot x + \ln(\sin x))$

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you try.... Diff! $y = x^{\cos x}$

$\ln y = \cos x \cdot \ln x$

$\frac{1}{y} y' = \cos x \cdot \frac{1}{x} + \ln x(-\sin x)$

$\frac{1}{y} y' = \frac{\cos x}{x} - \sin x \cdot \ln x$

$y' = y\left(\frac{\cos x}{x} - \sin x \cdot \ln x\right)$

$= x^{\cos x}\left(\frac{\cos x}{x} - \sin x \ln x\right)$

Ex: Suppose an object is moving on y-axis such that its position is $s(t) = \ln(t^2+1)$ for $t \geq 0$. CALC ok!

a) Find the velocity @ any time t.

$v(t) = s'(t) = \frac{1}{t^2+1} \cdot 2t = \frac{2t}{t^2+1}$

b. Find the acceleration @ $t = 2$.

$a(2) = v'(2) = -0.240$

c. Is the particle speeding up or slowing down @ $t = 2$? Justify.

$a(2) < 0$ $\qquad v(2) = 0.8$

$v(2) > 0$

The particle slowing down @ $t = 2$ b/c $v(2)$ & $a(2)$ have different signs.