AP Calculus AB
Thursday, December 5, 2013

Check HW answers with someone
Write the number of any "problem" problems on the board

pg 320
65 73
61
69 49
41

pg 347
65
73

---

(41) $y = \ln(x^3)$

Find slope of tangent line @ (1,0)

derivative

$y' = \frac{3x^2}{x^3}$ @ (1,0) $\rightarrow \boxed{m=3}$

(49) $y = \ln\left(x(x^2-1)^{1/2}\right)$

$$y' = \frac{x\left[\frac{1}{2}(x^2-1)^{-1/2}\cdot(2x)\right] + (x^2-1)^{1/2}\cdot 1}{x(x^2-1)^{1/2}}$$

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

Let $x^2-1 = c$

$$y' = \frac{x^2c^{-1/2} + c^{1/2}}{xc^{1/2}}$$

Factor a $c^{1/2}$ out of numerator.

$$\frac{x^2c^{-1/2}}{c^{1/2}} \quad \frac{+c^{1/2}}{c^{1/2}} \longrightarrow c^{1/2}(x^2c^{-1}+1)$$

$$y' = \frac{\cancel{c^{1/2}}(x^2c^{-1}+1)}{x\,\cancel{c^{1/2}}}$$

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

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

$$y' = xc^{-1} + \frac{1}{x}$$

$$y' = \frac{x}{x}\cdot\frac{x}{c} + \frac{1}{x}\cdot\frac{c}{c}$$

$$y' = \frac{x^2+c}{xc}$$

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

$$\boxed{y' = \frac{2x^2-1}{x(x^2-1)}}$$

(49) $y = \ln\left(x(x^2-1)^{1/2}\right)$

OR use a log property.....

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

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

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

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

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

(65) $y = \ln\left|\frac{\cos x}{\cos x - 1}\right|$

$u = \frac{\cos x}{\cos x - 1}$

$$u' = \frac{(\cos x-1)(-\sin x) - \cos x(-\sin x)}{(\cos x-1)^2}$$

$$u' = \frac{-\cancel{\sin x\cos x} + \sin x + \cancel{\sin x\cos x}}{(\cos x-1)^2}$$

$$u' = \frac{\sin x}{(\cos x-1)^2}$$

$$y' = \frac{\frac{\sin x}{(\cos x-1)^2}}{\frac{\cos x}{\cos x-1}}$$

$$y' = \frac{\sin x}{(\cos x-1)^{\cancel{2}}}\cdot\frac{\cancel{\cos x-1}}{\cos x}$$

$$y' = \frac{\tan x}{\cos x - 1}$$

same thing

use log prop.

$y = \ln\left|\frac{\cos x}{\cos x-1}\right|$

$y = \ln|(\cos x)| - \ln|\cos x - 1|$

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

$y' = -\tan x + \frac{\sin x}{\cos x - 1}$

⑥ p.348

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

$$y'=\frac{1}{2}(e^x-e^{-x})$$

CRITICAL VALUES → $y'=0$ or dne

$$\frac{1}{2}(e^x-e^{-x})=0$$

$$e^x=e^{-x}$$

$$x=0$$

$\frac{1}{2}(e^x-e^{-x})$

$\ominus$ at -1: $e^{-1}-e^{1}$, $\frac{1}{e}-e$

$\oplus$ at 1: $e^{1}-e^{-1}$, $e^{1}-\frac{1}{e}$

The derivative goes from negative to positive @ $x=0$.

$\therefore y=\frac{e^x+e^{-x}}{2}$ has a relative minimum @ $x=0$.

$$y=\frac{1}{2}(e^0+e^0)$$

$$y=1$$

Relative Minimum is located @ $(0,1)$.

$$y'=\frac{1}{2}(e^x-e^{-x})$$

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

$$\frac{1}{2}(e^x+e^{-x})=0$$

$e^x=-e^{-x}$ never $=0$ $\therefore$ No points of inflection.

① Write the answer to #49 p.322

② Use prop of logs to rewrite

$$y=\ln(x\sqrt[3]{x-2})$$

③ Find $f'(x)$ if $f(x)=(\ln x^2)\cdot e^{x^2}$