7/23/08

Has Shannon made up her own math?!

$$\ln(x^2-5)=\ln x^2-\ln 5$$

Pablo says yes!

let $x=3$

$$\ln(4)\stackrel{?}{=}\ln(9)-\ln(5)$$

Hopefully you are now convinced!

$$1.38\stackrel{?}{=}.59$$

$$f(x^2-5)\neq f(x^2)-f(5)$$

5.4 Homework Questions 53, 47, 67, 63

#53 Find equation of tangent line at $(1, e)$

$$y = x^2 e^x - 2xe^x + 2e^x$$

$$y' = [2xe^x + x^2 e^x] - 2[(1)e^x + xe^x] + 2e^x$$

$$y' = \cancel{2xe^x} + x^2 e^x - \cancel{2e^x} - \cancel{2xe^x} + \cancel{2e^x}$$

$$y' = x^2 e^x$$

at $x = 1$, $y' = (1)^2 e^{(1)} = e$

Tangent line at $(1, e)$

$$\boxed{y - e = e(x - 1)}$$

#47 $F(x) = \int_{\pi}^{\ln x} \cos(e^t)\,dt$

$\frac{d}{dx}\ln x = \frac{1}{x}$

$$\boxed{\frac{\cos x}{x}}$$

$$F'(x) = \cos e^{\ln x} \cdot \frac{1}{x}$$

$$= \frac{\cos x}{x}$$

apparently...
if there is a function of x in the upper limit of integration, you must first use the chain rule before you simplify when

apply the 2nd FTOC

#67 $g(x) = \frac{1}{\sqrt{2\pi}} e^{-(x-2)^2/2}$

$$g'(x) = \frac{1}{\sqrt{2\pi}} e^{\frac{-(x-2)^2}{2}} \left(-\cancel{2}(x-2)^1 \cdot 1\right) \cdot \frac{1}{\cancel{2}}$$

$$g'(x) = -\frac{x-2}{\sqrt{2\pi}} e^{\frac{-(x-2)^2}{2}}$$

$$0 = \underbrace{\frac{2-x}{\sqrt{2\pi}} e^{\frac{-(x-2)^2}{2}}}$$

the exponential part is NEVER 0 so if we set $2-x=0$ the whole expression zeros out

$x = 2 \rightarrow$ C.V. for g

$$g''(x) = -\frac{1}{\sqrt{2\pi}} e^{-\frac{(x-2)^2}{2}} + \frac{2-x}{\sqrt{2\pi}} e^{-\frac{(x-2)^2}{2}} \left(\frac{\overbrace{-\cancel{2}(x-2)\cdot 1}^{2-x}}{\cancel{2}} \right)$$

$$g''(x) = -\frac{1}{\sqrt{2\pi}} e^{-\frac{(x-2)^2}{2}} \left[1 - (2-x)^2 \right]$$

Relative Extrema

$$g''(2) = -\frac{1}{\sqrt{2\pi}} e^{-\frac{(2-2)^2}{2}} \left[1 - (2-2)^2 \right]$$

$$g''(2) = \left(-\frac{1}{\sqrt{2\pi}} \cdot 1 \right)(1) < 0 \Rightarrow \text{relative max at } \left(2, \frac{1}{\sqrt{2\pi}}\right)$$

Concavity

$$0 = \underbrace{\left(-\frac{1}{\sqrt{2\pi}} e^{-\frac{(x-2)^2}{2}}\right)}_{\text{never zero}}\left[1-(2-x)^2\right]$$

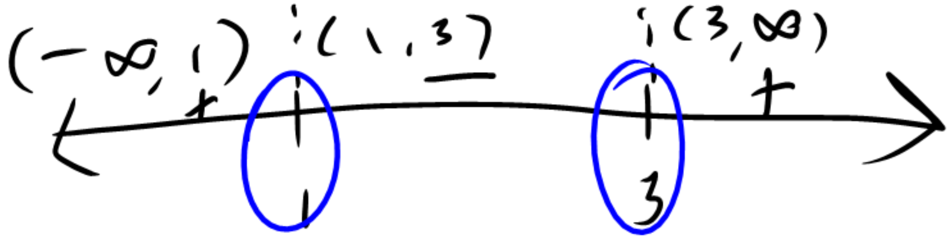
$$1-(2-x)^2 = 0$$

$$\sqrt{1} = \sqrt{(2-x)^2}$$

$$\pm 1 = 2-x$$

$2-x=1$ or $2-x=-1$

$x=1$ $\qquad$ $x=3$



inputs for the POI's

$$g''(x) = -\frac{1}{\sqrt{2\pi}} e^{-\frac{(x-2)^2}{2}}\left[1-(2-x)^2\right]$$

$$g''(0) > 0$$

$$g''(2) < 0$$

$$g''(4) > 0$$

$$g(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{(x-2)^2}{2}}$$

$$g(1) = \frac{1}{\sqrt{2\pi}} e^{-\frac{(1-2)^2}{2}} = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}} \qquad \left(1, \frac{1}{\sqrt{2\pi}} e^{-1/2}\right)$$

$$g(3) = \frac{1}{\sqrt{2\pi}} e^{-\frac{(3-2)^2}{2}} = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}} \qquad \left(3, \frac{1}{\sqrt{2\pi}} e^{-1/2}\right)$$