MATH 113 – QUIZ 7 – 23 OCTOBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) Find $f'(x)$ and $f''(x)$ if $f(x) = e^{-x^2}$.

$$f'(x) = -2xe^{-x^2} //$$

$$f''(x) = (-2x)(-2xe^{-x^2}) + e^{-x^2}(-2)$$

$$= e^{-x^2}(4x^2 - 2) //$$

2. (5 pts.) Find the equation of the line tangent to the curve given by the equation $x^4 - x^2y + y^4 = 1$ at the point $(-1, 1)$.

$$\frac{d}{dx}(x^4 - x^2y + y^4) = \frac{d}{dx}(1)$$

$$4x^3 - \left(x^2\frac{dy}{dx} + 2xy\right) + 4y^3\frac{dy}{dx} = 0.$$

Letting $x = -1, y = 1$

$$-4 - \left(+\frac{dy}{dx} - 2\right) + 4\frac{dy}{dx} = 0$$

$$-2 + 3\frac{dy}{dx} = 0 \longrightarrow \frac{dy}{dx} = \frac{2}{3} //$$

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

$$y = \frac{2}{3}x + \frac{5}{3} //$$

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1. (5 pts.) Find $f'(x)$ and $f''(x)$ if $f(x) = (x^2+1)^{1/2}$.

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

$$f''(x) = x\left[-\frac{1}{2}(x^2+1)^{-3/2}(2x)\right] + (x^2+1)^{-1/2}(1)$$

$$= -x^2(x^2+1)^{-3/2} + (x^2+1)^{-1/2}$$

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

2. (5 pts.) Find the equation of the line tangent to the curve given by the equation $e^{2y} + x = y$ at the point $(-1, 0)$.

$$\frac{d}{dx}(e^{2y}+x) = \frac{d}{dx}(y)$$

$$2e^{2y}\frac{dy}{dx} + 1 = \frac{dy}{dx}$$

Letting $x=-1, y=0$

$$2\frac{dy}{dx} + 1 = \frac{dy}{dx}$$

$$\Rightarrow \frac{dy}{dx} = -1 //$$

$$y - 0 = -1(x-(-1))$$

$$y = -x - 1 //$$

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Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) Find $f'(x)$ and $f''(x)$ if $f(x) = \sin^4(x)$.

$f'(x) = 4\sin^3(x)\cos(x)$ //

$f''(x) = 4\sin^3(x)(-\sin(x)) + (12\sin^2(x)\cos(x))\cos(x)$

$= -4\sin^4(x) + 12\sin^2(x)\cos^2(x)$ //

2. (5 pts.) Find the equation of the line tangent to the curve given by the equation $x^{3/2} + y^{2/3} = 9$ at the point $(4, 1)$.

$\frac{d}{dx}(x^{3/2} + y^{2/3}) = \frac{d}{dx}(9)$

$\frac{3}{2}x^{1/2} + \frac{2}{3}y^{-1/3}\frac{dy}{dx} = 0$

Letting $x = 4$ $y = 1$ $\longrightarrow$

$\frac{3}{2}(2) + \frac{2}{3}(1)\frac{dy}{dx} = 0$

$\frac{dy}{dx} = -\frac{9}{2}$ //

$y - 1 = -\frac{9}{2}(x - 4)$

$y = -\frac{9}{2}x + 19$ //