Name: Richard

MATH 200 – QUIZ 7

I'm in the Thurs11 Thurs12 Thurs1 or (Fri10) recitation. (Circle one)

October 11, 2012

1. This problem concerns the graph of the equation $e^y = 2\cos(2x)$.

(a) Use implicit differentiation to find $\frac{dy}{dx}$.

$$\frac{d}{dx}\left[e^y\right] = \frac{d}{dx}\left[2\cos(2x)\right]$$

$$e^y \frac{dy}{dx} = -2\sin(2x)\,2$$

$$e^y \frac{dy}{dx} = -4\sin(2x)$$

$$\boxed{\frac{dy}{dx} = \frac{-4\sin(2x)}{e^y}}$$

(b) Use your answer from part (a) to find the slope of the tangent line to the graph at the point $\left(\frac{\pi}{6}, 0\right)$.

$$\left.\frac{dy}{dx}\right|_{(x,y)=(\frac{\pi}{6},0)} = \frac{-4\sin\left(2\cdot\frac{\pi}{6}\right)}{e^0} = \frac{-4\sin\left(\frac{\pi}{3}\right)}{1} = -4\left(\frac{\sqrt{3}}{2}\right) = \boxed{-2\sqrt{3}}$$

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1. This problem concerns the graph of the equation $e^x = 2\cos(2y)$.

(a) Use implicit differentiation to find $\frac{dy}{dx}$.

$$\frac{d}{dx}\left[e^x\right] = \frac{d}{dx}\left[2\cos(2y)\right]$$

$$e^x = -2\sin(2y)\,2\frac{dy}{dx}$$

$$e^x = -4\sin(2y)\frac{dy}{dx}$$

$$\boxed{\frac{dy}{dx} = \frac{e^x}{-4\sin(2y)}}$$

(b) Use your answer from part (a) to find the slope of the tangent line to the graph at the point $\left(0, \frac{\pi}{6}\right)$.

$$\left.\frac{dy}{dx}\right|_{(x,y)=(0,\frac{\pi}{6})} = \frac{e^0}{-4\sin\left(2\cdot\frac{\pi}{6}\right)} = \frac{1}{-4\sin\left(\frac{\pi}{3}\right)} = \frac{1}{-4\left(\frac{\sqrt{3}}{2}\right)} = \boxed{\frac{-1}{2\sqrt{3}}}$$

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1. This problem concerns the graph of the equation $y\cos(y) = x^2$.

(a) Use implicit differentiation to find $\frac{dy}{dx}$.

$$\frac{d}{dx}\left[y\cos(y)\right] = \frac{d}{dx}\left[x^2\right]$$

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

$$\frac{dy}{dx}\left(\cos(y) - y\sin(y)\right) = 2x$$

$$\boxed{\frac{dy}{dx} = \frac{2x}{\cos(y) - y\sin(y)}}$$

(b) Use your answer from part (a) to find the slope of the tangent line to the graph at the point $(\sqrt{\pi}, -\pi)$.

$$\left.\frac{dy}{dx}\right|_{(x,y)=(\sqrt{\pi},\,-\pi)} = \frac{2\sqrt{\pi}}{\cos(-\pi) - (-\pi\sin(-\pi))} = \frac{2\sqrt{\pi}}{-1 + \pi\cdot 0} = \boxed{2\sqrt{\pi}}$$

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1. This problem concerns the graph of the equation $x\sin(y) = y$.

(a) Use implicit differentiation to find $\frac{dy}{dx}$.

$$\frac{d}{dx}\left[x\sin(y)\right] = \frac{d}{dx}\left[y\right]$$

$$(1)\sin(y) + x\cos(y)\frac{dy}{dx} = \frac{dy}{dx}$$

$$x\cos(y)\frac{dy}{dx} - \frac{dy}{dx} = -\sin(y)$$

$$\frac{dy}{dx}\left(x\cos(y) - 1\right) = -\sin(y)$$

$$\boxed{\frac{dy}{dx} = \frac{-\sin(y)}{x\cos(y) - 1}}$$

$$\boxed{\frac{dy}{dx} = \frac{\sin(y)}{1 - x\cos(y)}}$$

(b) Use your answer from part (a) to find the slope of the tangent line to the graph at the point $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$.

$$\left.\frac{dy}{dx}\right|_{(x,y)=\left(\frac{\pi}{2},\,\frac{\pi}{2}\right)} = \frac{-\sin\left(\frac{\pi}{2}\right)}{\frac{\pi}{2}\cos\left(\frac{\pi}{2}\right) - 1} = \frac{-1}{\frac{\pi}{2}\cdot 0 - 1} = \boxed{1}$$