Math 1A
Quiz 5 - October 7, 2009

Name: KEY

1. Find y' if $x^2 + xy^2 = \sin y$

Use implicit differentiation: $2x\left(\frac{dx}{dx}\right) + \left(1\cdot\frac{dx}{dx}\right)\cdot y^2 + (x)\cdot\left(2y\frac{dy}{dx}\right) = \cos y \frac{dy}{dx}$

$$2x + y^2 + 2xy\cdot y' = y'\cdot\cos y$$

$$2x + y^2 = y'\cos y - 2xy\cdot y'$$

$$2x + y^2 = y'(\cos y - 2xy)$$

$$\boxed{y' = \frac{2x+y^2}{\cos y - 2xy}}$$

2. Use log rules to simplify as best you can, $\ln(\cos^4(x)\cdot\sin(x)\cdot e^x)$

$$= \ln(\cos^4 x) + \ln(\sin x) + \ln(e^x)$$

$$= 4\ln(\cos x) + \ln(\sin x) + x$$

(Something to think about: If I had asked you to find the derivative of this function, would you have simplified it first this way, or used a messy combination of product and chain rules. Be alert for problems like this!)

3. Find the derivative of the following functions:

(a) $(17)^x$

$$17^x \cdot \ln 17$$

(b) $y = e^x \cdot x^{\sin x}$

$$\ln y = \ln\left(e^x \cdot x^{\sin x}\right) = \ln e^x + \ln\left(x^{\sin x}\right)$$

$$\ln y = x + \sin x \ln x$$

Take derivatives:

$$\frac{1}{y}\cdot\frac{dy}{dx} = 1 + \cos x\cdot\ln x + \frac{\sin x}{x}$$

$$\frac{dy}{dx} = y\left(1 + \cos x\ln x + \frac{\sin x}{x}\right) = e^x x^{\sin x}\left(1 + \cos x\ln x + \frac{\sin x}{x}\right)$$