Math 131, Fall 2016
Quiz 4, October 13, 2016
For all 8 a.m. Sections
Show enough work to make it clear how you got your answer.
Do NOT use any methods except those discussed so far in this course.

1. The point $(1, 1)$ is on the curve $x^2y^3 + y = 2$. What is the slope of the tangent line at $(1, 1)$?

We need the value of $\frac{dy}{dx} = y'$ at $(1,1)$

$x^2 3y^2 y' + 2x y^3 + y' = 0$

$x=1, y=1$: $3y' + 2 + y' = 0$

$4y' = -2$

$y' = -\frac{1}{2}$

2. Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = (\tan x)^x$

$y = (\tan x)^x$

$\ln y = \ln (\tan x)^x = x \ln(\tan x)$

$\frac{y'}{y} = x \cdot \frac{1}{\tan x} \cdot \sec^2 x + 1 \cdot \ln(\tan x)$

So $y' = y' (\quad) = (\tan x)^x \left[\frac{x \sec^2 x}{\tan x} + \ln(\tan x) \right]$

Math 131, Fall 2016
Quiz 4, October 13, 2016
For all 9 a.m. Sections
Show enough work to make it clear how you got your answer.
Do NOT use any methods except those discussed so far in this course.

1. The point $(1, 1)$ is on the curve $\frac{x^2}{y} + y^3 = 2$. What is the slope of the tangent line at $(1, 1)$?

We need the value of $\frac{dy}{dx} = y'$ at $(1,1)$:

$$\frac{y(2x) - x^2 y'}{y^2} + 3y^2 y' = 0$$

$x=1, y=1$:

$$\frac{2 - y'}{1} + 3y' = 0$$

$$2y' = -2$$

$$y' = -1$$

2. Find $f'(x)$ is $f(x) = \ln\left((2x+1)^3(x-1)^2 \sin x\right)$

$$f(x) = 3\ln(2x+1) + 2\ln(x-1) + \ln(\sin x)$$

$$\text{so } f'(x) = \frac{3 \cdot 2}{2x+1} + \frac{2}{x-1} + \frac{\cos x}{\sin x}$$

$$= \frac{6}{2x+1} + \frac{2}{x-1} + \cot x$$

↑ (leaving $\frac{\cos x}{\sin x}$ is o.k.)

Math 131, Fall 2016
Quiz 4, October 13, 2016
For all 10 a.m. Sections
Show enough work to make it clear how you got your answer.
Do NOT use any methods except those discussed so far in this course.

1. The point $(0, 1)$ is on the curve $e^{x^2y} = x + y$. What is $\frac{dy}{dx}$ at the point $(0, 1)$?

$\frac{dy}{dx} = y'$

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

$x=0, y=1$: $\quad 1\left(0 + 0\right) = 1 + y'$

so $y' = -1$

2. Find y' if $y = \ln|x| - \ln\left(\frac{2x+1}{(x+1)^{10}}\right)$

$y = \ln|x| - \left[\ln(2x+1) - 10\ln(x+1)\right]$

$y' = \frac{1}{x} - \frac{2}{2x+1} + \frac{10}{x+1}$

Math 131, Fall 2016
Quiz 4, October 13, 2016
For all 11 a.m. Sections
Show enough work to make it clear how you got your answer.
Do NOT use any methods except those discussed so far in this course.

1. The point $(0, 0)$ is on the curve $\sin(x + y^2) = 2x + y$. What is $\frac{dy}{dx}$ at the point $(0, 0)$?

$\frac{dy}{dx} = y'$

$\cos(x+y^2)(1+2yy') = 2+y'$

$x=y=0$: $\cos(0)\cdot(1) = 2+y'$, so $1=2+y'$

so $y' = -1$

2. Use logarithmic differentiation to find the derivative of $y = f(x) = x^{\cos x}$

$y = x^{\cos x}$

$\ln y = \ln(x^{\cos x}) = \cos x \cdot \ln x$

$\frac{y'}{y} = \frac{\cos x \cdot \frac{1}{x} + \ln x(-\sin x)}{\quad}$

so $y' = y[\quad]$

$= x^{\cos x}\left[\frac{\cos x}{x} - \ln x \sin x\right]$

Math 131, Fall 2016
Quiz 4, October 13, 2016
For all 12 p.m. Sections
Show enough work to make it clear how you got your answer.
Do NOT use any methods except those discussed so far in this course.

1. The point $(0, 1)$ is on the curve $ye^{y+x} = e$. What is the slope of the tangent line at $(0, 1)$?

We need the value of $y' = \frac{dy}{dx}$ at $(0,1)$

$$ye^{y+x}(y'+1) + y'e^{y+x} = 0$$

$x=0, y=1$:

$$1 \cdot e^1(y'+1) + y'e^1 = 0$$

$$ey' + e + ey' = 0$$

$$2ey' = -e$$

$$y' = -e/2e = -1/2$$

2. Find $\frac{dy}{dx}$ for $y = \ln\left(\frac{(2x+1)^6(x+1)^5}{xe^x}\right)$

$$y = 6\ln(2x+1) + 5\ln(x+1) - (\ln x + \ln e^x)$$

$$\text{So } y' = \frac{12}{2x+1} + \frac{5}{x+1} - \frac{1}{x} - 1$$

$$y' = \frac{dy}{dx}$$