

Worksheet #14; date: 03/06/2018
MATH 53 Multivariable Calculus

1. (Stewart 14.3.50) Use implicit differentiation to find $\partial z/\partial x$ and $\partial z/\partial y$.

$$yz + x \ln y = z^2.$$

2. (Stewart 14.5.11) Use the chain rule to find $\partial z/\partial s$ and $\partial z/\partial t$.

$$z = e^r \cos \theta, \quad r = st, \quad \theta = \sqrt{s^2 + t^2}.$$

3. (Stewart 14.5.29) Use Equation 6 (included here)

$$\text{if } F(x, y) = 0 \text{ defines } y \text{ as a function of } x, \text{ then } \frac{dy}{dx} = -\frac{\frac{\partial F}{\partial x}}{\frac{\partial F}{\partial y}} = -\frac{F_x}{F_y}$$

to find dy/dx .

$$\tan^{-1}(x^2y) = x + xy^2$$

4. Turn in your HW so I can go over the extra challenge question here.
5. (Stewart 14.5.52; extra challenge) If $z = f(x, y)$, where $x = r \cos \theta$ and $y = r \sin \theta$, find
- (a) $\partial z/\partial r$
 - (b) $\partial z/\partial \theta$
 - (c) $\partial^2 z/\partial r \partial \theta$
6. Quiz time!
7. (Stewart 14.6.23) Find the maximum rate of change of f at the given point and the direction in which it occurs.

$$f(x, y) = \sin(xy)$$