

MATH 2850 Sec 003  
 ELEMENTARY MULTIVARIABLE CALCULUS  
 QUIZ 2  
 January 30, 2013

Name (Last, First) Key

1. Find  $\partial f/\partial x$  and  $\partial f/\partial y$ .

$$f(x, y) = e^{-x} \sin(x + y)$$

$$\begin{aligned} \frac{\partial f}{\partial x} &= e^{-x} \cdot \frac{\partial}{\partial x} \sin(x+y) + \sin(x+y) \frac{\partial}{\partial x} e^{-x} \\ &= e^{-x} \cos(x+y) - e^{-x} \sin(x+y) \end{aligned}$$

$$\begin{aligned} \frac{\partial f}{\partial y} &= e^{-x} \frac{\partial}{\partial y} \sin(x+y) + \sin(x+y) \frac{\partial}{\partial y} e^{-x} \\ &= e^{-x} \cos(x+y) \end{aligned}$$

2. Let

$$z = 4e^x \ln y, \quad x = \ln(u \cos v), \quad y = u \sin v; \quad (u, v) = (2, \pi/4)$$

Using the Chain Rule evaluate  $\partial z/\partial u$  at the given point.

$$\begin{aligned} \frac{\partial z}{\partial u} &= \frac{\partial z}{\partial x} \cdot \frac{\partial x}{\partial u} + \frac{\partial z}{\partial y} \cdot \frac{\partial y}{\partial u} \\ &= 4e^x \ln y \cdot \frac{1}{u \cos v} \cdot \cos v + \frac{4e^x}{y} \cdot \sin v \\ &= \frac{4e^x \ln y}{u} + \frac{4e^x \sin v}{y} \\ &= \frac{4e^{\ln \sqrt{2}} \ln \sqrt{2}}{2} + \frac{4e^{\ln \sqrt{2}} \sin \frac{\pi}{4}}{\sqrt{2}} \\ &= 2\sqrt{2} \ln \sqrt{2} + 4 \cdot \frac{1}{\sqrt{2}} = \boxed{\sqrt{2} \ln 2 + 2\sqrt{2}} \end{aligned}$$

$x(2, \frac{\pi}{4}) = \ln(2 \cos \frac{\pi}{4}) = \frac{1}{2} \ln 2$   
 $y(2, \frac{\pi}{4}) = 2 \sin \frac{\pi}{4} = \sqrt{2}$