Name (Last, First)_____Key_____

1. Find $\partial f/\partial x$ and $\partial f/\partial y$.
$$f(x,y) = e^{-x}\sin(x+y)$$

$\dfrac{\partial f}{\partial x} = e^{-x} \cdot \dfrac{\partial}{\partial x}\sin(x+y) + \sin(x+y)\dfrac{\partial}{\partial x}e^{-x}$

$\qquad = e^{-x}\cos(x+y) - e^{-x}\sin(x+y)$

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

$\qquad = e^{-x}\cos(x+y)$

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.

$\dfrac{\partial z}{\partial x}$ z $\dfrac{\partial z}{\partial y}$

$\dfrac{\partial x}{\partial u}$ x $\dfrac{\partial x}{\partial v}$ $\dfrac{\partial y}{\partial u}$ y $\dfrac{\partial y}{\partial v}$

u v u v

$x\left(2,\tfrac{\pi}{4}\right) = \ln\left(2\cos\tfrac{\pi}{4}\right) = \tfrac{1}{2}\ln 2$

$y\left(2,\tfrac{\pi}{4}\right) = 2\sin\tfrac{\pi}{4} = \sqrt{2}$

$\dfrac{\partial z}{\partial u} = \dfrac{\partial z}{\partial x}\cdot\dfrac{\partial x}{\partial u} + \dfrac{\partial z}{\partial y}\cdot\dfrac{\partial y}{\partial u}$

$= 4e^x \ln y \cdot \dfrac{1}{u\cos v}\cdot\cos v + \dfrac{4e^x}{y}\cdot\sin v$

$= \dfrac{4e^x \ln y}{u} + \dfrac{4e^x \sin v}{y}$

$= \dfrac{4e^{\ln\sqrt{2}}\ln\sqrt{2}}{2} + \dfrac{4e^{\ln\sqrt{2}}\sin\tfrac{\pi}{4}}{\sqrt{2}}$

$= 2\sqrt{2}\ln\sqrt{2} + 4\cdot\dfrac{1}{\sqrt{2}} = \boxed{\sqrt{2}\ln 2 + 2\sqrt{2}}$