

Name:

SOLUTIONS

Quiz #5 - October 8, 2004

1. Let  $w = xy + yz^2$  where  $x = t^2$ ,  $y = \cos t$ ,  $z = e^t$ .

a. Find  $\partial w / \partial t$ .

b. Find  $\partial w / \partial t$  at time  $t = 0$ .

$$\frac{dw}{dt} = \frac{dw}{dx} \frac{dx}{dt} + \frac{dw}{dy} \frac{dy}{dt} + \frac{dw}{dz} \frac{dz}{dt}$$

$$= y \cdot 2t + (x + z^2)(-\sin t) + 2yz e^t$$

$$\text{at } t=0 \quad x=0, y=1, z=1$$

$$\frac{dw}{dt} = 0 + 0 + 2e^0 =$$

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2. Find the tangent plane to the surface  $x^2 + 2y^2 + z^2 = 18$  at the point  $(1, 2, 3)$ .

$$\nabla F = (2x, 4y, 2z) = (2, 8, 6)$$

$$2(x-1) + 8(y-2) + 6(z-3) = 0$$

3. Let  $f(x, y) = xy$ . Find the rate of change of  $f(x, y)$  at the point  $(2, 3)$  in the direction  $(1, 3)$ .

$$\vec{u} = \left( \frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right)$$

$$\nabla F = (y, x) \quad \nabla F(2, 3) = (3, 2)$$

$$D_{\vec{u}} = (3, 2) \cdot \left( \frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right) = \frac{9}{\sqrt{10}}$$