

## Quiz 5

Name: \_\_\_\_\_ Section and/or TA: \_\_\_\_\_

Answer all questions in a clear and concise manner. Unsupported answers will receive *no credit*.

1. (2 points) Find the first partial derivatives of the function  $u(r, \theta) = \sin(r \cos \theta)$

**Solution:**

$$\begin{aligned}\frac{\partial u}{\partial r} &= \cos(r \cos \theta) \cos(\theta) \\ \frac{\partial u}{\partial \theta} &= -r \cos(r \cos \theta) \sin(\theta)\end{aligned}$$

2. (3 points) The function  $f(x, y) = \sqrt{xy}$  is differentiable at the point  $(1, 4)$ . Find the linearization  $L(x, y)$  of the function at this point.

**Solution:** Computing the partial derivatives, we get

$$f_x(x, y) = \frac{y}{2\sqrt{xy}}$$

$$f_y(x, y) = \frac{x}{2\sqrt{xy}}$$

Then we find the linearization

$$\begin{aligned}L(x, y) &= f_x(1, 4)(x - 1) + f_y(1, 4)(y - 4) + f(1, 4) \\ &= (x - 1) + \frac{1}{4}(y - 4) + 2\end{aligned}$$