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) Use the Chain Rule to find $\frac{dz}{dt}$ where $z = x^2 + y^2 + xy$, $x = sin(t)$, and $y = e^t$. No need to simplify.

> **Solution:** Recall $\frac{dz}{dt} = \frac{\partial z}{\partial x}\frac{dx}{dt} + \frac{\partial z}{\partial y}\frac{dy}{dt}$ We find: $\frac{\partial z}{\partial x} = 2x + y$, $\frac{\partial z}{\partial y} = 2y + x$, $\frac{dx}{dt} = cos(t)$, and $\frac{dy}{dt} = e^t$. Thus $\frac{dz}{dt} = (2x + y)cos(t) + (2y + x)e^t$.

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

> **Solution:** Computing the partial derivatives, we get
>
> $$f_x(x, y) = \frac{y}{(x+y)^2}$$
>
> $$f_x(x, y) = \frac{-x}{(x+y)^2}$$

Then we find the linearization

$$\begin{aligned} L(x,y) &= f_x(2,1)(x-2) + f_y(2,1)(y-1) + f(2,1) \\ &= \frac{1}{9}(x-2) - \frac{2}{9}(y-1) + \frac{2}{3} \end{aligned}$$