Math 233 - Test 3b

Name _____

November 11, 2021

Score _____

Show all work to receive full credit. Supply explanations where necessary. You must work individually on this test. This test is due November 16.

---

1. (8 points) Find a set of parametric equations for the line normal to the surface $z = e^{4x^2+2xy-6y}$ at the point $(1, 1, 1)$.

2. (6 points) Find the linearization of $h(x, y) = \tan^{-1}(y/x)$ at the point $(1, 1)$. Then use the linearization to approximate $h(0.98, 1.03)$.

3. (8 points) Use the definition of differentiability to show that $f(x, y) = x^2 + 3xy - 2y^2 - y$ is differentiable everywhere on $\mathbb{R}^2$.

4. (10 points) Find and classify the critical points of $g(x, y) = y^3 - 3yx^2 - 3y^2 - 3x^2 + 1$.

5. (8 points) The *body mass index* (BMI) for an adult human is given by $B = 703w/h^2$, where w is weight in pounds and h is height in inches. Suppose you weigh 185 lbs and your height is 68 in. Compute your BMI. Then assume your weight and height measurements have errors $\Delta w = 1.75$ lbs and $\Delta h = 0.5$ in. Use differentials to estimate the error in your BMI.