MATH 242
FALL 2017 NAME:
EXAM 3

1. $\boxed{\text{10 pts.}}$ Find an equation of the plane tangent to the surface given by $xy^2 + 3x - z^2 = 4$ at the point $(2, 1, -2)$.

2. $\boxed{\text{10 pts.}}$ Find all points on the surface $z = 3x^2 + 2y^2 - 3x + 4y - 5$ where the tangent plane is horizontal.

3. $\boxed{\text{15 pts.}}$ Use the 2nd Derivative Test to find all relative extrema and saddle points on the surface $z = e^{-x} \sin y$.

4. $\boxed{\text{15 pts.}}$ Use the 2nd Derivative Test and other tools to find the *absolute* extrema of

$$f(x, y) = x^2 + xy$$

over the rectangular region $R = \{(x, y) : |x| \le 2,\ |y| \le 1\}$.

5. $\boxed{\text{15 pts.}}$ Use the Lagrange Multiplier Method to find the maximum and minimum values (if any) of

$$f(x, y, z) = x + 3y - z$$

subject to the constraint $x^2 + y^2 + z^2 = 4$.

6. $\boxed{\text{10 pts.}}$ Use a convenient order of integration to evaluate

$$\iint_R x \sec^2 xy \, dA, \quad R = \{(x, y) : 0 \le x \le \pi/3,\ 0 \le y \le 1\}.$$

7. $\boxed{\text{10 pts.}}$ Write an iterated integral of a continuous function f over the region R that is the triangle with vertices $(0, 0)$, $(0, 2)$, $(1, 1)$.

8. $\boxed{\text{10 pts.}}$ Evaluate

$$\iint_R 3xy \, dA,$$

where R is the region bounded by $y = 2 - x$, $y = 0$, and $x = 4 - y^2$ in the first quadrant.

9. $\boxed{\text{10 pts.}}$ Evaluate

$$\iint_R \frac{1}{1 + x^2 + y^2} \, dA$$

using polar coordinates, where R consists of points in the xy-plane having polar coordinates in the set $\{(r, \theta) : 1 \le r \le 2,\ 0 \le \theta \le \pi\}$.