Worksheet 10 / 15 points

Name: Section: 2 4 (circle one)

1. A space probe in the shape of the ellipsoid

$$4x^2 + y^2 + 4z^2 = 16$$

enters the Earth's atmosphere and its surface begins to heat. After 1 hour, the temperature at the point (x, y, z) on the probe's surface is

$$T(x, y, z) = 8x^2 + 4yz - 16z + 600.$$

Find the hottest point on the probe's surface.

2. Find the points on the sphere $x^2 + y^2 + z^2 = 25$ where the function $f(x, y, z) = x + 2y + z$ has it's minimum and maximum values.

3. Find the point on the plane $x + 2y + 3z = 13$ closest to the point $(1, 1, 1)$.

4. For the following functions, use Taylor series to find a polynomial of degree 3 that approximates the function for points (x, y) "near" the origin.

   $f(x, y) = \ln(3x + 4y + 1)$

   $f(x, y) = e^{x^2+y^2}$