AMAT 309 L02 Winter 2003
Quiz 3 30 Minutes

NAME: _____ **ID:** _____

1. Plot the portion of the surface $z = 10 - 5x - 2y$ that lies in the first octant. Also give a (one-word) description of the level curves of this surface. [25]

2. For each of the follwing answer True or False. [25]

   (a) An equation $F(x, y, z) = 0$ describes a surface in $\mathbb{R}^3$. _____

   (b) A vector equation $\mathbf{r} = \langle x(s,t), y(s,t), z(s,t) \rangle$ describes a surface in $\mathbb{R}^3$ _____

   (c) For any twice differentiable function $f(x, y)$, $f_{12} = f_{21}$. _____

   (d) For any 3 times differentiable function $f(x, y)$, $f_{12} = f_{21}$. _____

   (e) The equation of the normal line to the surface $z = f(x, y)$ at a point $P = (a, b, c)$ on this surface, in vector parametric form, is $\mathbf{r} = \langle tf_1 + a,\ tf_2 + b,\ -t + c \rangle$. _____

3. Determine any point(s) on the surface $z = x^3 + 2xy^2 + 3$ at which the tangent plane is parallel to the plane $z = 11x + 8y - 3$. [25]

[Hint: First derive the equations $3x^2 + 2y^2 = 11,\ xy = 2$.]

4. Given $z = f(x, y),\ x = s^2 + t^2,\ y = 2st,$ and also given the partial derivatives $f_1(5, 4) = -3,\ f_1(2, 1) = 6,\ f_2(5, 4) = 5,\ f_2(2, 1) = 1,$ determine $z_s(2, 1)$, i.e. [25]

$$\frac{\partial z}{\partial s}\Big|_{\substack{s=2\\t=1}} .$$