Name _____

Homework 9
Sections 14.5, 19.3, 20.1

1. (4,5) The temperature (in °F), T, at a point (x, y, z) in a certain environment is given by $T(x, y, z) = (x + 2y)^2 + xz - yz^3 + 5y$, where x, y, and z are measured in feet.
[Be sure to include units in the answers to the following if appropriate.]

   (a) If a bug is at the point $(6, 1, 2)$, in what direction does the bug need to fly in order to experience the most rapid increase in temperature?

   (b) If a bug the leaves the point $(6, 1, 2)$ and instead heads in a straight line toward the point $(9, 0, 4)$, what is the rate of change in temperature that the bug is experiencing as it leaves $(6, 1, 2)$?

2. (5) Determine the equation of the plane which is tangent to the graph of

$$2xz + y^3 e^{2z-6} = x^4 - 5y - 16$$

at the point $(1, -2, 3)$. Write your answer in the form $ax + by + cz = d$.

3. (3) Consider the vector field $\vec{F}(x,y,z) = (x^2+4z)\,\vec{i} + (6xyz - e^{3y})\,\vec{j} - \left(xy + \frac{8}{z}\right)\vec{k}$. Compute the divergence $\vec{F}$ at the point $(3,0,2)$.

4. (3) Compute the curl of $\vec{F} = (2yz+xy)\vec{i} + (3xz+y)\vec{j} + (9xy+z)\vec{k}$.