Math 241, Spring 2001, Exam 3

There are 9 problems on 5 pages. Problem 1 is worth 12 points. Each of the other problems is worth 11 points. SHOW your work. $\boxed{CIRCLE}$ your answer. **NO CALCULATORS!**

1. Find the directional derivative of $f(x,y) = x^2y$ at the point $P = (1,2)$ in the direction of $\overrightarrow{u} = \frac{3}{5}\overrightarrow{i} - \frac{4}{5}\overrightarrow{j}$.

2. Let $f(x,y) = xe^{xy}$. Find $\overrightarrow{\nabla} f$.

3. Find the equation of the plane tangent to $x^2 + y^2 + 2z^2 = 7$ at $(1,2,1)$.

4. Find the equations of the line perpendicular to $x^2 + y^2 + 2z^2 = 7$ at $(1,2,1)$.

5. Graph and label the level sets $f = 0$, $f = 1$, and $f = -1$ for $f(x,y) = \frac{x}{y}$.

6. Sketch the curve parameterized by $\overrightarrow{r}(t) = \cos t\,\overrightarrow{i} + t\,\overrightarrow{j} + \sin t\,\overrightarrow{k}$ in $3-$ space.