Math 2313, Final

Name _____

1. Find a vector parallel to both of the planes $x+y+z=10$ and $y+z=7$.

   answer: $<0,-1,1>$

2. Find the equation of the tangent plane to the surface $x^2+y^2+z^2=9$ at $(1,-2,2)$.

   answer: $2x-4y+4z=18$

3. Find $\frac{dU}{dp}$ at $(x,y,z)=(1,1,0)$ if $U=x^3+ln(xy)+e^{3yz}$, and at this point, $\frac{dx}{dp}=2, \frac{dy}{dp}=1, \frac{dz}{dp}=3$.

   answer: 18

4. Evaluate $\int_0^3 \int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} e^{x^2+y^2} dydx$

   answer: $\frac{\pi}{2}(e^9-1)$

5. Find the directional derivative of $f(x,y) = e^{yx^2} + sin(xy) + ln(x)$ at the point $(1,0)$ in the direction of the vector $< 3, -4 >$.

answer: -1

6. If $f(x,y) = x^3 - 6xy + y^3$, find all critical points and classify each as a local minimum, local maximum, or saddle point. (Second derivative test shown on board.)

answer: $(0,0)$ is saddle point, $(2,2)$ is local minimum.

7. Write an integral which, if evaluated (but don't evaluate), would give the mass of the tetrahedron in the first octant under the plane $4x + 2y + z = 8$, if the density is given by $\rho(x,y,z)$.

answer: $\int_0^2 \int_0^{4-2x} \int_0^{8-4x-2y} \rho(x,y,z) dz dy dx$