

NAME & S.S.N.:

SCORE:

1. (15 points) Find the rectangular coordinates of the center of the sphere with spherical equation $\rho = (5 \sin \theta - 8 \cos \theta) \sin \phi$.

2. (10 points) Find the length of one turn of the helix

$$\mathbf{r} = [\cos(4t)]\mathbf{i} + [\sin(4t)]\mathbf{j} - 4t\mathbf{k}.$$

3. (10 points) Find $\lim_{(x,y) \rightarrow (0,0)} \frac{x^3 y^3}{x^6 + y^8}$ if it exists.

4. (15 points) Find $\frac{\partial z}{\partial y}$ if $x e^{yz} + y \cos(xz) + z \ln(xy) = 5$.

5. (10 points) Find an equation for the tangent plane to the graph of $z = x^3 - 5y^2$ over the point $(2, -1)$ in the xy -plane. Also give an equation for the corresponding normal line of the graph.

6. (10 points) Determine the local extrema and saddle points of $f(x, y) = y^2 - y^4 - x^2$, if they exist.

7. (15 points) Find the maximum and minimum values of the function $g(x, y) = x + 3y$ on the curve $x^2 + 7y^2 = 1$. Where does the maximum occur?

8. (10 points) Use differential to estimate the amount of tin in a closed tin can with diameter 10 inches and height 15 inches if the tin is 0.03 inches thick.