

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each question.

1. For the function $f(x, y) = x^2 e^{xy/2}$, sketch the trace of the graph when $y=0$ and $y=2$. Sketch at least 5 level curves of the graph. Put the traces on one graph, and the five level curves on another.

2. Sketch the vector field $\vec{F}(x, y) = 2xy\hat{i} + x^2\hat{j}$. Plot at least 10 points or more to determine the general behavior of the field.

3. Find the value of the line integral $\int_C (x + y^2) ds$ along the curve $\vec{r}(t) = \cos t \hat{i} + \sin t \hat{j}$.

4. Find the value of the line integral $\int_C (x + 2y) dx + (3x - y) dy$ along the curve $\vec{r}(t) = t \hat{i} + t^2 \hat{j}$.

5. Determine what kind of surface is being modeled with the parametric function $\vec{r}(u, v) = u \cos v \hat{i} + u \sin v \hat{j} + u \hat{k}$. Describe the surface in as much detail as possible or sketch the graph.

6. Write a vector-valued function for the surface described by $x = \sqrt{16y^2 + z^2}$.