

PROBLEMS

(1) Do the following limit problems:

(a) Let $a, b \geq 0$. Show that the limit

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^a y^b}{x^2 + y^2}$$

is 0 if $a, b > 2$ and does not exist if $a + b \leq 2$.

(b) Determine whether the following limit exists or not:

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^3 y^2 + x^2 y^3}{x^4 + y^4}$$

(2) How does the surface described in spherical coordinates by $\rho^2(1 + A \cos^2(\phi)) = 1$ change with the constant A .

(3) Find the parametrization of the intersection of the surfaces $x^2 + y^2 = 3$ and $z^3 - 6y + 4x = 17$. Set up an integral for the arclength of the curve.

(4) Find f such that:

(a) $\frac{\partial}{\partial x} f = 6x^2 y$, and $\frac{\partial}{\partial y} f = 2x^3 - 3$

(b) $\frac{\partial}{\partial x} f = e^x - y \sin(xy)$, and $\frac{\partial}{\partial y} f = -x \sin(xy) + 5y^4$

(5) Parametrize by arclength the helix $r(t) = \langle 4 \cos(5t), 4 \sin(5t), 3t \rangle$

(6) Consider the sphere $x^2 + y^2 + z^2 = 30$. When is the tangent plane parallel to the plane $3x - 5y + 7z = 8$?