

Tutorial Worksheet

Show all your work.

1. Do the following limits exist? If it exists, compute the limit, if not, explain why it does not exist.

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

2. Find $f_{yx}(1,2)$, $f_{xx}(1,2)$, $f_{yy}(1,2)$ and $f_{xy}(1,2)$ for the function $f(x,y) = x^3 + 2x^2y^2 + y^3$.

3. Identify the level curves of $f(x,y) = \sqrt{x^2 + y^2}$. Using the level curves, plot the surface.

4. If the position of an object is given by $r(t) = (\frac{1}{2}t^2 + 1)i + (t^2 + t - 2)j + (t^3 - t + 3)k$, then determine the tangential and normal components of acceleration.

5. A cannon fires a ball with mass of 2 kg with an initial speed of 100 m/s at an angle of 45 degrees to the ground in the easterly direction. A southwesterly wind applies a steady force of $2\sqrt{8}$ N to the ball in a northeasterly direction. At what time does the ball land?