

Homework 6 — MATH 1586 Spring 2018

Recall that $z = f(x, y)$ describes a surface. The level curves of the surface are the curves we get for picking a fixed value for K and looking at the curve $K = f(x, y)$. If a limit does not exist, that fact may be detected by going along one of the “five paths”:

- i. y -axis
- ii. x -axis
- iii. $y = x$
- iv. $y = x^2$
- v. $y = \sqrt{x}$

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1. Let $f(x, y, z) = x^2y + xyz + z^2$. Compute $f(1, 2, 3)$.
 2. Consider the surface $z = 4x - y$. Draw level curves of the surface corresponding to $K = -1$, $K = 0$, and $K = 1$.
 3. Consider the surface $z = \sqrt{9 - x^2 - y^2}$. Draw level curves of the surface corresponding to $K = 0$, $K = 2$, and $K = 3$.
 4. Consider the surface $z = -2x^2 - y$. Draw level curves of the surface corresponding to $K = -1$, $K = 0$, and $K = 1$.
 5. Show the limit does not exist: $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{x^2 + 3y^2}$.
 6. Show the limit does not exist: $\lim_{(x,y) \rightarrow (0,0)} \frac{3x^2 + 4y}{3x + 4y}$.
 7. What is $\lim_{(x,y) \rightarrow (3,4)} e^{xy}(x^2 - 3y)$?
 8. Let $f(x, y) = 3x^2y + 5y^3$. Calculate $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$.
 9. Let $f(x, y, z) = e^{xy}(z^2x + z \ln(y) + x^2yz)$. Calculate $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$, and $\frac{\partial f}{\partial z}$.