

Homework Section 14.2

- Given $\lim_{(x,y) \rightarrow (2,3)} f(x,y) = 8$, under what condition does $f(2,3) = 8$?
- Find the limit if it exists. If the limit does not exist, then find two paths in the xy -plane that produce different limits in order to verify that it doesn't exist.

a) $\lim_{(x,y) \rightarrow (-2,4)} 2x^2y - 5x^3y^2 + 7$

b) $\lim_{(x,y) \rightarrow (0,0)} \frac{3+2y}{\cos(3x-2y)}$

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

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

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

f) $\lim_{(x,y,z) \rightarrow (-2,4,2)} 2x^2y - 5x^3y^2z - 7z$

- Let $g(t) = t^2 + \sqrt{t}$ and $f(x,y) = 2x + 3y - 6$. Find $h = g(f(x,y))$ and the set on which h is continuous.
- For which sets of points are the following functions continuous?

a) $f(x,y) = \frac{x}{\sqrt{x+y-2}}$

b) $f(x,y) = \sin^{-1}(x^2 + y^2)$

c) $g(x,y) = \ln(x^2 + y^2 - 4)$

d) $f(x,y) = \begin{cases} \frac{xy}{x^2 + xy + y^2} & \text{if } (x,y) \neq (0,0) \\ 0 & \text{if } (x,y) = (0,0) \end{cases}$

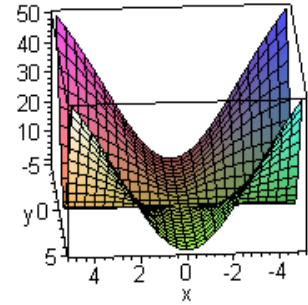
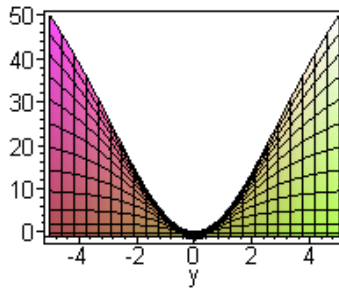
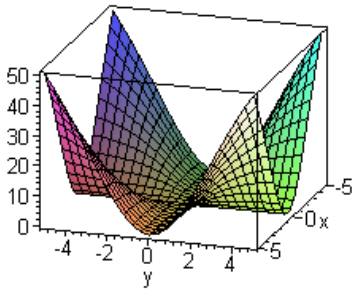
- Consider the function $f(x,y) = \frac{xy}{\sqrt{x^2 + y^2}}$. Fill in the below table with function values accurate to the nearest thousandth and then make a conjecture about the value of

$\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{\sqrt{x^2 + y^2}}$ **[See the Excel video]**

y \ x	-0.2	-0.1	-0.05	0	0.05	0.1	0.2
-0.2							
-0.1							
-0.05							
0							
0.05							
0.1							
0.2							

6. Below are three different views of the graph of $f(x, y) = \frac{4x^2y^2}{x^2 + y^2}$.

a) Use these graphs to make a conjecture about the value of $\lim_{(x,y) \rightarrow (0,0)} \frac{4x^2y^2}{x^2 + y^2}$. Then explain how you got your answer.



7. Use the Epsilon-Delta definition of limit to prove that $\lim_{(x,y) \rightarrow (a,b)} x = a$

