MATH-5C Class Work 9/18

Only one member needs to submit to Canvas. It will automatically show up as submitted for each member

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(1)Match the following functions with their graphs: (axes are in standard orientation with the x axis in red, y green, z blue.)

a) $f(x,y)=\dfrac{1}{1+x^2y^2}$ __________ D

If x or y=0 F(x,y)=1 and f→0 as x,y→∞

(b) $f(x,y)=\cos(x+y)$ ____ A ____

If y=-x, cos(0)=1

domain $x^2>y$

c) $f(x,y)=\ln(x^2-y)$ __________ F

(d) $f(x,y)=\cos(xy)$ __________ B

If x or y=0 f(x)=1 oscilates

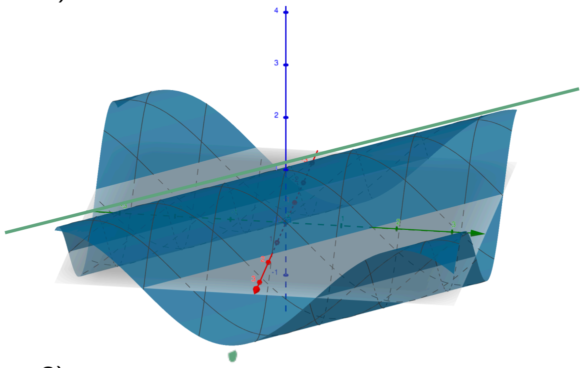
→0 as |(x,y)|→∞

e) $f(x,y)=\dfrac{1}{x^2+y^2}$ ________ C

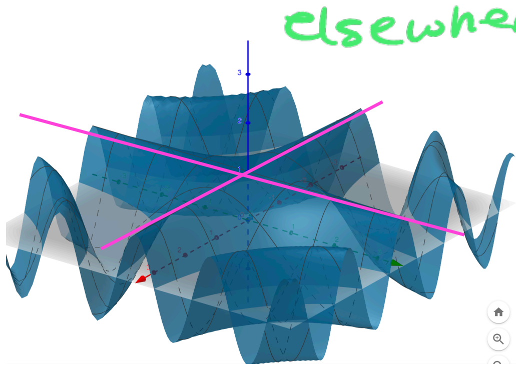
(f) $f(x,y)=\dfrac{1}{x^2-y}$ __________ E

undefined for $y=x^2$ but defined elsewhere

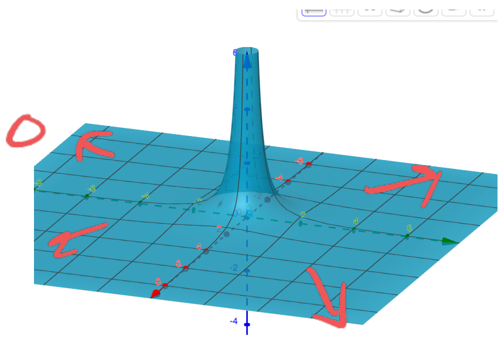
A)



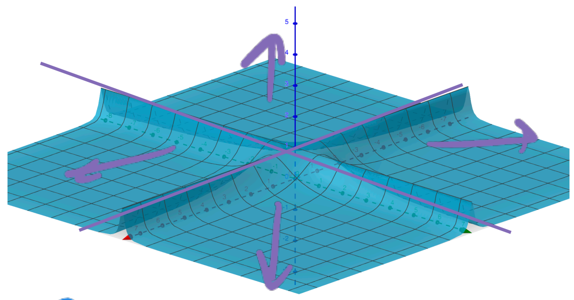
B)



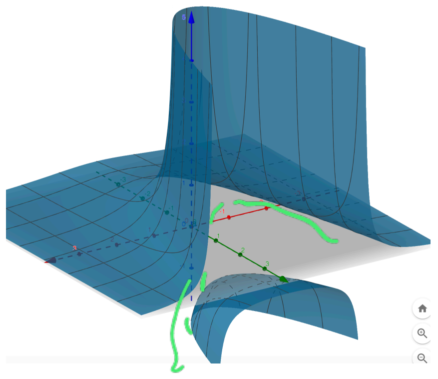
C)



D)

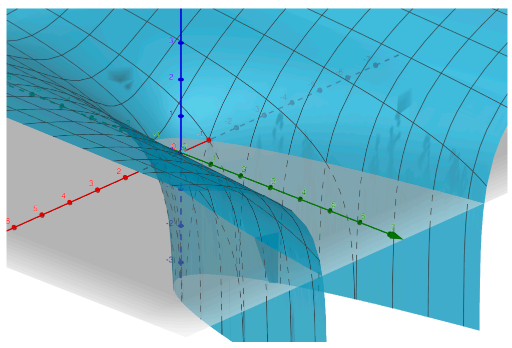


E)



domain $y<x^2$

F)



(2) Algebraically show that each of the following limits do not exist by considering different paths of approach. Explore: graph the function using computer software like Geogebra. Include a screen shot that shows that your algebraic result if confirmed by the graph, or anything else of note..

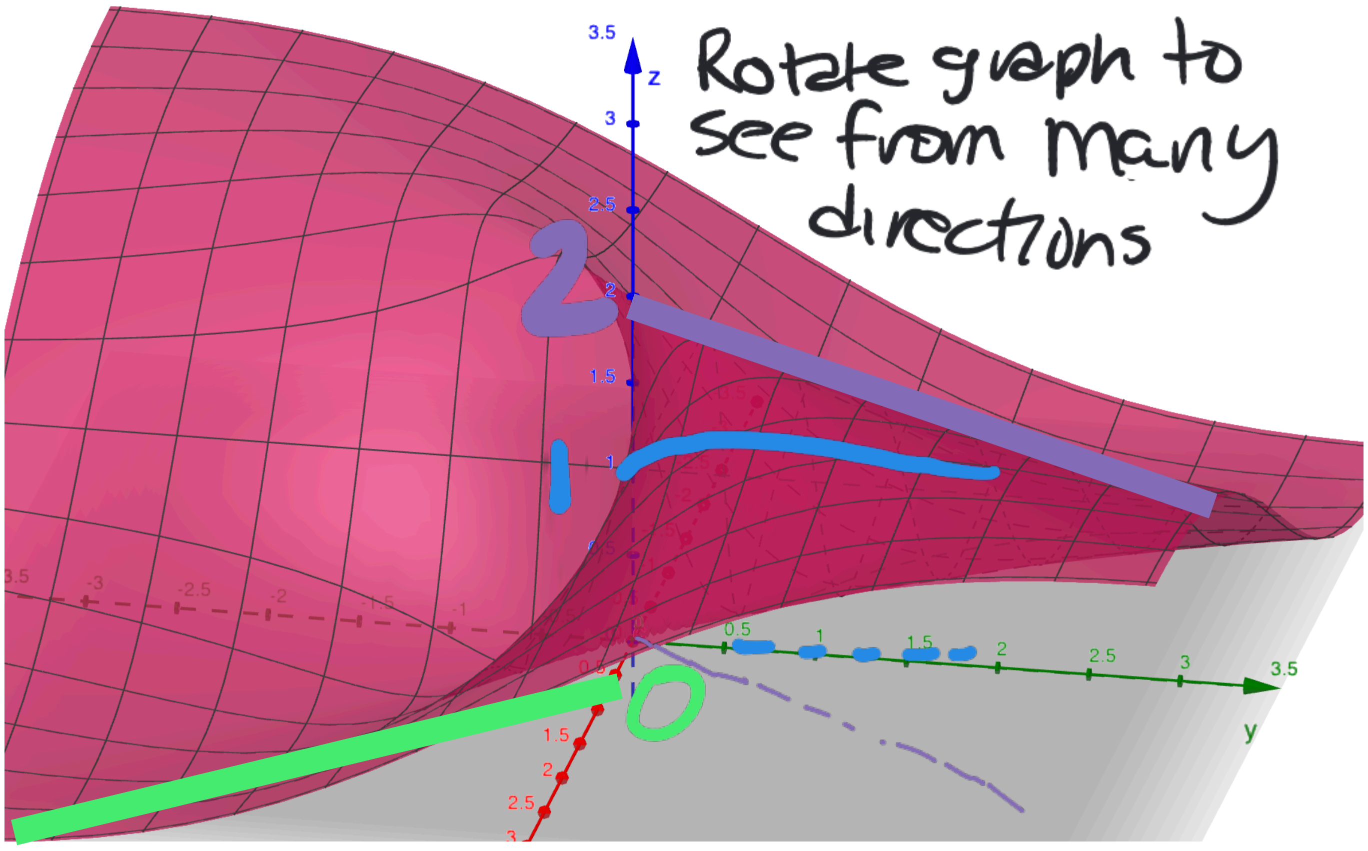
$$\lim_{(x,y)\to(0,0)} \frac{(x+y)^2}{x^2+y^2}$$

Paths

$x=0$ $\quad \lim_{y\to 0} \frac{y^2}{y^2} = 1$

$y=-x$ $\quad \lim_{x\to 0} \frac{x-x}{x^2+x^2} = 0$

$y=x$ $\quad \lim_{x\to 0} \frac{(2x)^2}{2x^2} = 2$

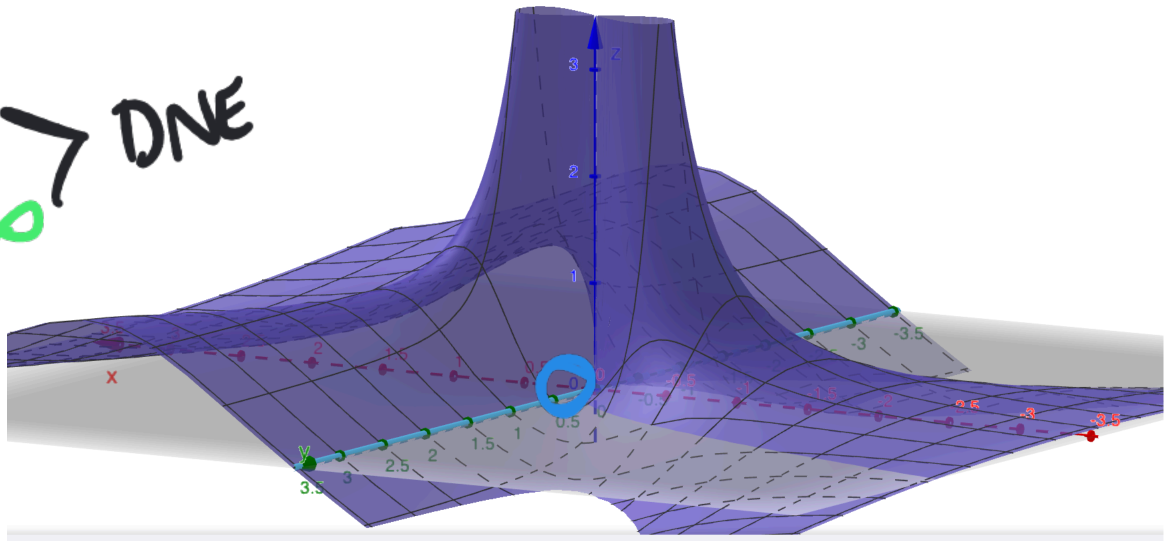


$$\lim_{(x,y)\to(0,0)} \frac{x^2+xy^2}{x^4+y^2}$$

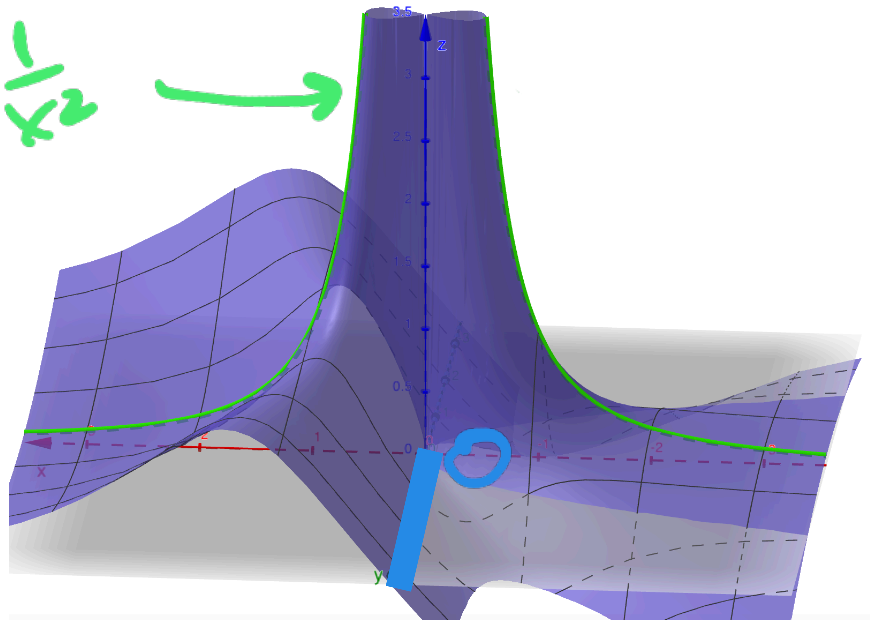
$x=0$ $\quad \lim_{y\to 0} \frac{0}{y^2} = 0$

$y=0$ $\quad \lim_{x\to 0} \frac{x^2}{x^4} = \lim_{x\to 0} \frac{1}{x^2} = \infty$

DNE



$y = \frac{1}{x^2}$



$$\lim_{(x,y)\to(0,0)} \frac{y^2 \sin^2 x}{x^4+y^4}$$ (You might find it helpful to look at the graph for ideas about the approach)

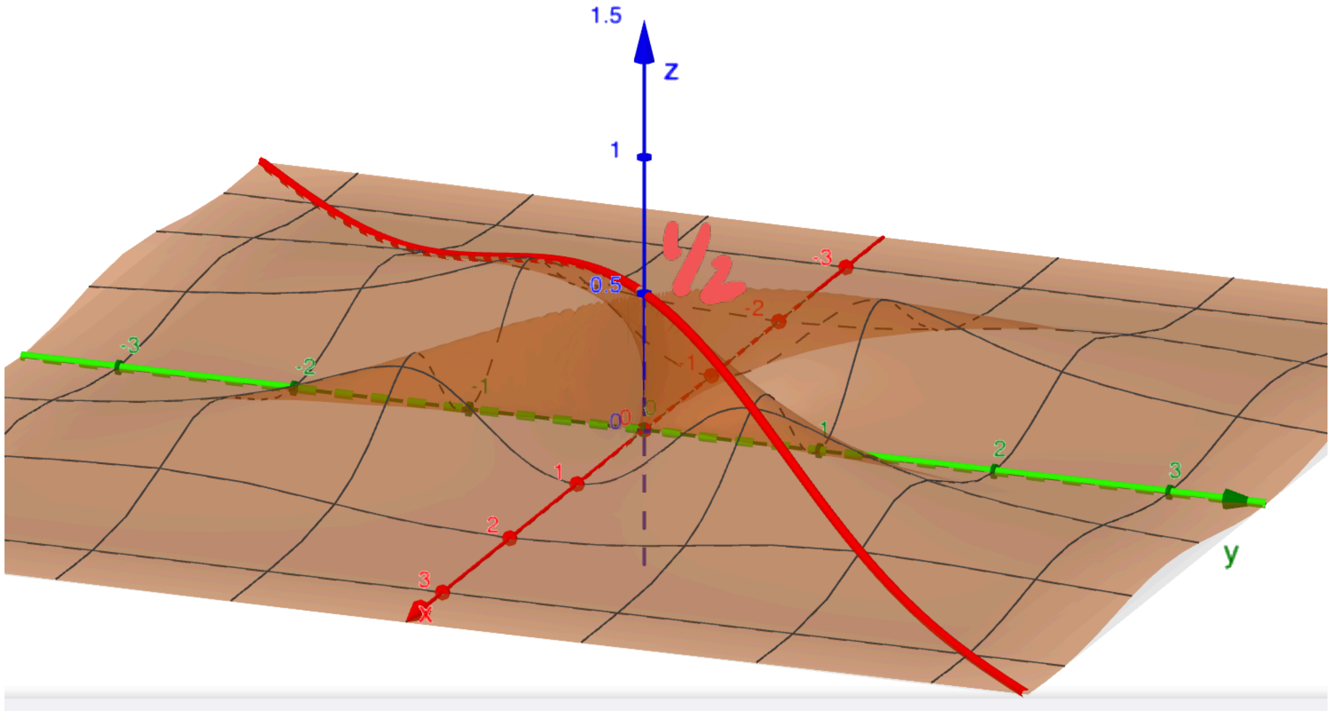
$x=0 \quad \lim_{y\to 0} \frac{0}{y^4} = 0$

$y=x \quad \lim_{x\to 0} \frac{x^2 \sin^2 x}{2x^4}$

$= \lim_{x\to 0} \frac{\sin^2 x}{2x^2}$

$= \lim_{x\to 0} \frac{1}{2}\left(\frac{\sin x}{x}\right)^2$

$= \frac{1}{2}$



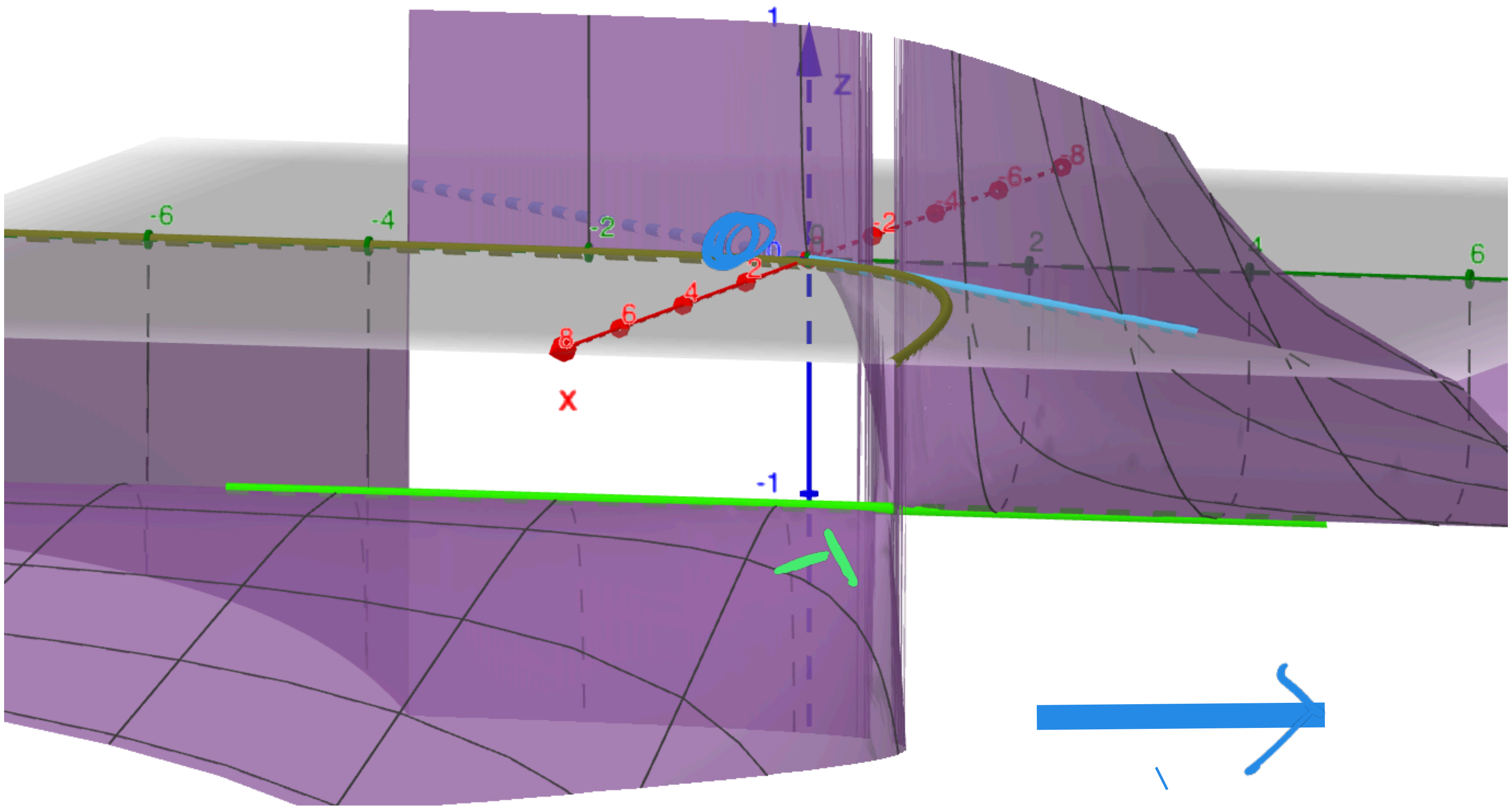
$$\lim_{(x,y)\to(1,1)} \frac{y-x}{1-y+\ln x}$$ (Note: This is (x,y) approaching (1,1) so path must go through (1,1))

$x=1 \quad \lim_{y\to 1} \frac{y-1}{1-y} = -1$

$y=x \quad \lim_{x\to 1} \frac{0}{1-x+\ell}$

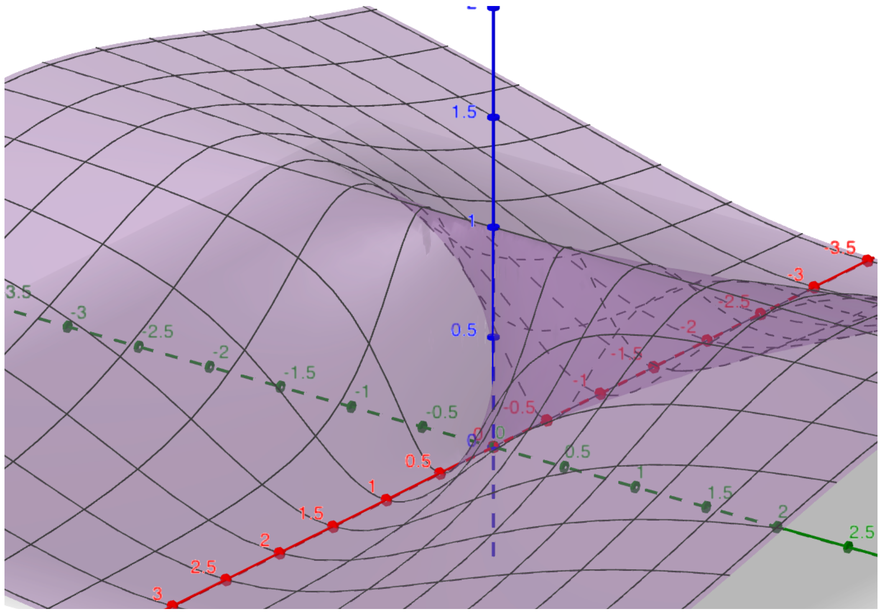
$= \lim_{x\to 1} 0$

$= 0$

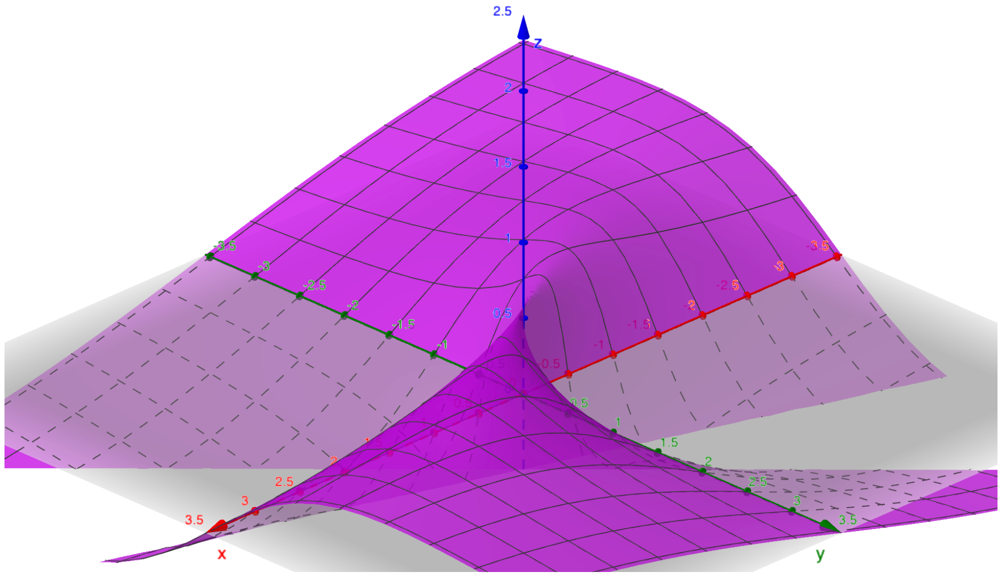


Examples

$$\lim_{(x,y)\to(0,0)} \frac{y^2}{x^2+y^2}$$



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



Hint: $\lim_{(x,y)\to(0,0)} \dfrac{y^2 \sin^2 x}{x^4 + y^4}$