

PRINT Your Name: _____

There are 10 problems on 6 pages. Each problem is worth 10 points. SHOW your work. **CIRCLE** your answer. NO CALCULATORS!

1.

(a) Find $\lim_{\substack{(x,y) \rightarrow (0,0) \\ \text{along } y=3x}} \frac{x^2 y}{x^4 + y^2} = \lim_{x \rightarrow 0} \frac{3x^3}{x^4 + 9x^2} = \lim_{x \rightarrow 0} \frac{3x^3}{x^2(x^2 + 9)} = \lim_{x \rightarrow 0} \frac{3x}{x^2 + 9}$

$$= \frac{0}{9} = \textcircled{0}$$

(b) Find $\lim_{\substack{(x,y) \rightarrow (0,0) \\ \text{along } y=2x^2}} \frac{x^2 y}{x^4 + y^2} = \lim_{x \rightarrow 0} \frac{2x^4}{x^4 + 4x^4} = \lim_{x \rightarrow 0} \frac{2x^4}{5x^4} = \lim_{x \rightarrow 0} \frac{2}{5} = \textcircled{\frac{2}{5}}$

(c) What is $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y}{x^4 + y^2}$? Why? This limit does not exist because the answer to (a) is different than the answer to (b).