

## Math 213 - 11.2 - Limits

Try to estimate the following limits by graphing or by plugging small values of  $x$  and  $y$  into the appropriate functions. Remember that path independence is important - so try different paths. If the limit exists (or if the limit is  $\pm\infty$ ) indicate that and try to justify your answer (e.g. using squeeze theorem or converting to polar coordinates) . If the limit does not exist, explain why.

1.  $\lim_{(x,y) \rightarrow (0,0)} 5$

5.  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^3 y^2}{x^4 + y^8}$

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

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

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

7.  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - xy}{\sqrt{x} - \sqrt{y}}$

4.  $\lim_{(x,y) \rightarrow (0,0)} \frac{\sin(2(x+y))}{x+y}$

8.  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + y^2}{\sqrt{x^2 + y^2 + 25} - 5}$