Worksheet 7

1. Show that the limit does not exist:
$$\lim_{(x,y)\to(0,0)} \frac{y^2}{x^2 + y^2}.$$

2. Show that the limit does not exist:
$$\lim_{(x,y)\to(0,0)} \frac{|x|}{|x| + |y|}.$$

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

4. Show that the limit does not exist:
$$\lim_{(x,y)\to(0,0)} \frac{x^3 y}{x^6 + y^2}.$$

5. Find
$$\lim_{(x,y)\to(0,0)} \frac{e^{-3y} \sin(-2x)}{-3x}.$$

6. Find
$$\lim_{(x,y)\to(3,4)} \frac{xy - 3y - 7x + 21}{x - 3}.$$

7. Find
$$\lim_{(x,y)\to(1,0)} \frac{\sqrt{x - 4y} - 1}{x - 4y - 1}.$$

8. Find
$$\lim_{(x,y)\to(0,0)} \frac{\sin(x^{10} + y^{10})}{x^{10} + y^{10}}.$$

9. Find
$$\lim_{(x,y)\to(0,0)} \cos\left(\frac{x^3 - y^3}{x^2 + y^2}\right).$$