Quiz 6

9/24/10

1. Find the limit or show it does not exist:

$$\lim_{(x,y)\to(0,0)} \frac{2x}{2x+3y} \qquad \frac{2(0)}{2(0)+3(0)} = \frac{0}{0} \times$$

Plug in $y = cx \rightarrow$ $\dfrac{2x}{2x+3(cx)} = \dfrac{2x}{2x+3cx} = \dfrac{2x}{(2+3c)x} =$

$$\lim_{x\to 0} \frac{2}{2+3c}$$

Since this depends on the slope c, we get different limits for different lines, hence the limit does not exist

2. $$\lim_{(x,y)\to(0,0)} \frac{x^5}{x^2+y^2} \qquad \frac{(0)^5}{(0)^2+(0)^2} = \frac{0}{0} \times$$

plug in $y = cx$ $= \dfrac{x^5}{x^2+(cx)^2} = \dfrac{x^5}{x^2+c^2x^2} = \dfrac{x^5}{(1+c^2)x^2}$

$$\lim_{x\to 0} \frac{x^3}{1+c^2}$$

This does not depend on the slope, the limit might actually be 0

Use polar coordinates:

$x = r\cos\theta \qquad y = r\sin\theta \qquad r^2 = x^2+y^2$

$$f(r\cos\theta, r\sin\theta) = \frac{(r\cos\theta)^5}{r^2} = \frac{r^5\cos^5\theta}{r^2} = r^3\cos^5\theta$$

$$(0)^3\cos^5(0) = 0$$

$\therefore$ The limit exists and equals to 0.