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Quiz for Lecture 6

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Section 22.

1. Find the limit of it exists, or show that the limit does not exist.

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

~~step1: plug in (0,0) find the numerator and~~

step1:
$$\lim_{(x,y)\to(0,0)} \frac{2x}{2x+3y} = \frac{0}{0}$$

step2: $y = cx$

$$\lim_{x\to 0} \frac{2x}{2x+3(cx)} = \lim_{x\to 0} \frac{2x}{(2+3c)x} = \frac{2}{2+3c}$$

the limit does not exist. Because the ~~number~~ limit is not ~~stable~~ constant. It decide by C.

Ans: the limit does not exist.

2. Find the limit of it exists, or show that the limit does not exist.

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

step1:
$$\lim_{(x,y)\to(0,0)} \frac{x^5}{x^2+y^2} = \frac{0}{0}$$

step2: $(y-b) = c(x-a) \to y = cx$

$$\lim_{x\to 0} \frac{x^5}{x^2+(cx)^2} = \lim_{x\to 0} \frac{x^5}{x^2(c+1)} = \lim_{x\to 0} \frac{x^3}{(c+1)} = 0$$

If change the point, the limit will change, we need more proof.

(2) step3.

set $x = r\cos\theta \quad y = r\sin\theta$

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

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

$$\lim_{r\to 0} r^3\cos^5\theta = 0.$$

Ans: The limit exists and equals 0.