$$\lim_{(x,y)\to(1,3)} \frac{x^2y}{4x^2-y}$$

$\Longrightarrow$

$$\frac{1^2(3)}{4(1)^2-3} = \frac{1(3)}{4-3} = \frac{3}{1} = 3$$

$$\lim_{(x,y)\to(\pi,1)} \frac{cos(xy)}{y^2+1}$$

$$\frac{\cos[(\pi)(1)]}{1^2+1} = \frac{\cos(\pi)}{1+1} = \frac{-1}{2} = -\frac{1}{2}$$

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

$$\frac{3(0)^2}{(0)^2+(0)^2} = \frac{0}{0}$$

$$x = 0$$

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

$$x = y$$

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

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

$$x = x_0 = 0$$

$$\lim_{(0,y)\to(0,0)} \frac{y\sin 0}{0+y^2} = \lim_{y\to 0} 0 = 0$$

$$\lim_{(x,x)\to(0,0)} \frac{x\sin x}{x^2+x^2} = \lim_{x\to 0} \frac{\sin x}{2x} = \lim_{x\to 0} \frac{\cos x}{2} = \frac{1}{2}$$

$$\lim_{(x,y)\to(1,2)} \frac{xy-2x-y+2}{x^2-2x+y^2-4y+5}$$

$$\lim_{(x,y)\to(1,2)} \frac{xy-2x-y+2}{x^2-2x+y^2-4y+5} = \lim_{(x,y)\to(1,2)} \frac{(x(y-2)-(y-2))}{x^2-2x+1+y^2-4y+4} = \lim_{(x,y)\to(1,2)} \frac{(x-1)(y-2)}{(x-1)^2+(y-2)^2}$$

$$x' = x - 1$$

$$y' = y - 2$$

$$(1, 2) \to (0, 0)$$

$$\lim_{(x,y)\to(1,2)} \frac{(x-1)(y-2)}{(x-1)^2+(y-2)^2} = \lim_{(x',y')\to(0,0)} \frac{x'y'}{x'^2+y'^2}$$

$$x' = 0$$

$$\lim_{(0,y')\to(0,0)} \frac{(0)y'}{0+y'^2} = \lim_{(0,y')\to(0,0)} 0 = 0$$

$$x' = y'$$

$$\lim_{(x',x')\to(0,0)} \frac{x'^2}{x'^2 + x'^2} = \lim_{x'\to 0} \frac{1}{2} = \frac{1}{2}$$

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

$$\lim_{(0,y,z)\to(0,0,0)} \frac{0}{0+y^2+z^2} = \lim_{(y,z)\to(0,0)} 0 = 0$$

$$x = y = z$$

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

$$\lim_{(x,y,z)\to(0,0,0)} \frac{xyz}{x^3+y^3+z^3}$$

$$\lim_{(0,y,z)\to(0,0,0)} \frac{(0)yz}{(0)^3+y^3+z^3} = \lim_{(y,z)\to(0,0)} 0 = 0$$

$$\lim_{(x,x,x)\to(0,0,0)} \frac{x^3}{x^3+x^3+x^3} = \lim_{x\to 0} \frac{1}{3} = \frac{1}{3}$$