MTH 310 HW 5 Estelean Morales

Section 11.2

8.) $\lim_{(x,y)\to(1,0)} \frac{xy-y}{(x-1)^2+y^2}$ DNE

$(f(0,y))$

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

$f(x,0)$

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

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

$f(0,y)$

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

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

Section 11.3

16.) $u(r,\theta) = \sin(r \cdot \cos(\theta))$

$$\frac{\partial u}{\partial r} = \sin(r \cdot \cos(\theta))' = \cos(\theta) \cdot \cos(r \cdot \cos(\theta))$$

$$\frac{\partial u}{\partial \theta} = \sin(r \cdot \cos(\theta))' = \cos(r \cdot \cos(\theta)) \cdot r$$

20.) $F(\alpha, \beta) = \int_{\alpha}^{\beta} \sqrt{t^3+1}\, dt$

$$\Rightarrow \frac{\partial F}{\partial \alpha} = -\sqrt{\alpha^3+1}$$

$$\frac{\partial f}{\partial \beta} = \sqrt{\beta^3+1}$$

24.) $w = ze^{x \cdot y \cdot z}$

$$\frac{dw}{\partial x} = z \cdot y \cdot z\, e^{xyz}$$

$$\frac{\partial w}{\partial y} = z \cdot x \cdot z\, e^{xyz}$$

$$\frac{\partial w}{\partial z} = \cancel{z \cdot x \cdot y\, e^{xyz}}$$

$$e^{xyz} + z e^{xyz} xy$$

Section 11.3

44.) $Z = f(x) \cdot g(y)$

a.)

$$\frac{\partial z}{\partial x} = f'(x) \cdot g(y) \qquad \frac{\partial z}{\partial y} = g'(y)\, f(x)$$

b.) $Z = f(x \cdot y)$

let $u = x \cdot y$

$$Z = f(u) \quad \Rightarrow \quad \frac{\partial z}{\partial x} = f'(u) \cdot y = f'(xy) \cdot y$$

$$\frac{du}{\partial x} = y$$

$$\frac{\partial z}{\partial y} = f'(xy) \cdot x$$

c.) $Z = f(\frac{x}{y}) \qquad Z = f(u)$

$$U = \frac{x}{y}$$

$$\frac{\partial z}{\partial x} = f'(u) \cdot \frac{1}{y} = \frac{f'(\frac{x}{y})}{y}$$

$$\frac{\partial u}{\partial x} = \frac{1}{y} \qquad \frac{\partial u}{\partial y} = \frac{-x}{y^2}$$

$$\frac{dz}{\partial y} = f'(\frac{x}{y}) \cdot \frac{-x}{y^2}$$