Tayed Raza 10/4/2020

14.3: 3, 5, 17, 19, 21, 27, 31, 39, 47

3.

$$\frac{\partial}{\partial y} \frac{y}{x+y} \qquad y'=1 \qquad \frac{(x+\cancel{y}) - \cancel{y}}{(x+y)^2} = \frac{x}{(x+y)^2}$$

5. $f(x, y, z) = xyz$

$f_z(x, y, z) = 2 \cdot 3 = 6$

17.

$$\frac{\partial}{\partial x}\left(\frac{x}{y}\right) = \frac{1}{y}, \quad \frac{\partial}{\partial y}\left(\frac{x}{y}\right) = -\frac{x}{y^2} \qquad xy^{-1} = -\frac{x}{y^2}$$

19.

$$\frac{\partial}{\partial x} = \frac{1}{2}(9 - x^2 - y^2) \cdot -2x = -x(9-x^2-y^2)^{-\frac{1}{2}}$$

$$\frac{-x}{\sqrt{9-x^2-y^2}}$$

$$\frac{\partial}{\partial y} = \frac{1}{2}(9-x^2-y^2)^{-\frac{1}{2}} \cdot -2y \quad \frac{-y}{\sqrt{9-x^2-y^2}}$$

21. $\frac{\partial f}{\partial x} = (\cos x)(\sin y)$

$\frac{\partial f}{\partial z} = (\cos y)(\sin x)$

27. $W = e^{r+s}$

$\frac{\partial}{\partial r} = e^{r+s}$

$\frac{\partial}{\partial s} = e^{r+s}$

31. $\frac{\partial y}{\partial x} = -2xe^{-x^2-y^2}$

$\frac{dy}{dy} = -2ye^{-x^2-y^2}$

39. $\frac{\partial q}{\partial L} = \frac{e^{-Lt/M}}{M} + \frac{-L(L)e^{-Lt/M}}{M}$

$\frac{\partial q}{\partial t} = \frac{-L^2}{M^2}e^{-Lt/M}$

$\frac{\partial q}{\partial M} = \frac{-e^{-Lt/M}}{M^2} + \left(\frac{L}{M}\right)\left(\frac{Lt}{M^2}\right) \cdot e^{-Lt/M}$

$= L\,\frac{(Lt - M)}{M}$

#7.

a. $45.33 + 0.6845(95) + 5.758(50)$
$- 0.00365(95)^2 - 0.1563(95)(90)$
$+ 0.001(50)(95)^2$ 73.2

b. $L_T(T,H) = 0.6845 + 5.758H -$
$(2)(0.00365)(T) - 0.1565H + 0.002HT$

$L_T(95,50) = 1.66$

14, 9; 3, 5, 7, 13, 15, 17, 23, 25, 27

3. $f(x,y) = 2x + 1 = 5$

$f(1,1) = x^2 + 3y^2x = 28$ $(y-28) = \frac{1}{2}(x-5)$

5. $f_x(x,y) = 2x + y^{-2} = 8$

$f_y(x,y) = y^2 - 2y^{-3} = 16 - \frac{2}{3} = \frac{44}{3}$

$y - \frac{41}{3} = \frac{24}{41} (x - 8)$

7. $F_r(r,s) = 2rs^{1/2} - 3s^{4} = \frac{13}{4}$

$F_s(r,s) = \frac{r^2}{2} s^{\frac{1}{2}} - 3s^{-1} = -1$

$r - \frac{13}{4} = \frac{-4}{13}(s+1)$

13 $f(2.01, 1.02) = 8.1 = 8$

$f(1.97, 1.01) = 8.1 = 8$

5

$f(x, y) = x^3 y^{-4}$

$f'(x, y) = x^3 y^{-4}$

$8 \quad f(2.03, 0.97) = 12.8$

$12.8 - 8 = 4.8$

21

$f(x,y) = e^{x^2+y}$

$f(0.01, -0.02) \approx e^{0.01^2-0.02}$ $= 0.98$

23 $(2.01)^3(1.02^2) = 8.45$

$(2)^3(1) = 8$

25

$\sqrt{3.01^2+3.99^2} \approx 4.99$

$\sqrt{3^2+4^2}$ $= 5$

27

$\sqrt{(1.9)(2.02)(4.05)} \approx 3.97$

$\sqrt{(2)(2)(4)} = 4$

14.5: 7, 11, 13, 19, 27, 31, 33, 37, 39, 41, 43

7. $\langle yz^{3}, xz^{-3}, -3xyz^{-4} \rangle$

11. $r'(t) = \langle \cos t, \sin t \rangle$ $\quad f'(x,y) = 2x + 3(x+y)$

$t = 0$ $\quad 2x - 3x - 3y$

$-x - 3y$

$\langle 1, 0 \rangle$ $\quad f'(1,0) = -1$ $\quad 8$

13. $r(0)\ (1,1)$

$f'(x,y) = \cos(xy)\,(x+y)$

$f'(1,1) = \cos(1)\,(2) = 2\cos(1)$

17. $r(1) = \langle e, 1, 1 \rangle$ $\quad \frac{e^t t}{t^2}$

$\frac{g(e,1,1)}{t}\ 2 = e$

27. $V = 3i - 2i$

$\langle 3, 2 \rangle$

$f'(3,2) = \dfrac{2x+2y}{9+4} = \dfrac{10}{13}$

31. $f_x'(x,y) = 2x + 4y^2 = 6 + 16 = 22$

$f_y'(x,y) = x^2 + 8y = 9 + 16 = 25$

$\sqrt{22^2 + 25^2} = 33.3$

33. $T_x(x,y,z) = 0 \cdot z e^{y-z} = 0$

$T_y(x,y,z) = e^{y-z} + x(y-z)e^{y-z} = e^5 + 3(4)e^4$

$e^5 + 12e^4$

$T_z(x,y,z) = e^{y-z} = e^4$

$\sqrt{e^8 + (e^{19} + e)^2}$

37. $\langle 2, -4, 4 \rangle \; \langle 2, 1, 3 \rangle$

$4 - 4 + 12 = 12$ Increasing

39. $f_x(x,y,z) = 2\cos(y+z)$ $\quad (0, -1, \pi)$

$= 2\cos(\pi - 1)$

$f_y(x,y,z) = 2\cos(y+z) = 2\cos(\pi - 1)$

$f_z(x,y,z) = (x+y)\sin(xy+z) = -\sin(\pi) = 0$

$\sqrt{2\cos(\pi-1)^2 + (2\cos(\pi-1))^2}$

41. $3,1,2$

$F_x(x) = 2x + y^2 - z^2 = 6 + 1 - 4 = 3$

$f_y(x) = x^2 + 2y - z^2 = 9 + 2 - 4 = 7$

$f_z(y) = x^2 + y^2 + 2z = 9 + 1 - 4 = 6$

$\langle 3, 7, 6 \rangle$

$1, 1, -2$

43 $f_x() = \frac{x}{2} + \frac{y^2}{9} + z^2 = 0$ $1, 1, -2$

$f_y() = \frac{x^2}{4} + \frac{2y}{9} + z^2 = 0$

$f_z() = \frac{x^2}{4} + \frac{y^2}{9} + 2z = 0$

$\langle 0, 0, 0 \rangle$

$\langle \frac{4}{\sqrt{\quad}}, \frac{9}{\sqrt{\quad}}, \frac{-2}{\sqrt{2}} \rangle$

13 $f(2.01, 1.02) \approx 8.1 = 8$

$f(1.99, 1.01) = 8.1 = 8$

5

$f(x, y) = x^3 y^{-4}$

$f'(x, y) = x^3 y^{-4}$

8

$f(2.03, 0.9) = 12.8$

$12.8 - 8 = 4.8$