14.3

3. $\frac{\partial}{\partial y}\frac{y}{x+y}$

$= \frac{1(x+y) - y(1)}{(x+y)^2}$

$= \frac{x+y-y}{(x+y)^2}$

$= \frac{x}{(x+y)^2}$

17. $z = \frac{x}{y}$

$\frac{\partial}{\partial x} = \frac{y-0}{y^2} = \frac{1}{y}$

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

21. $z = \sin x \sin y$

$\frac{\partial}{\partial x} = \cos x \sin y$

$\frac{\partial}{\partial y} = \sin x \cos y$

31. $z = e^{-x^2-y^2}$

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

$= -2x e^{-x^2-y^2}$

$\frac{\partial}{\partial y} = -2y e^{-x^2-y^2}$

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

$f_z(2,3,1)$.

$f_z = xy$.

$= 2 \times 3 = 6$

19. $z = \sqrt{9-x^2-y^2} = (9-x^2-y^2)^{\frac{1}{2}}$

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

$= -x \cdot \frac{1}{\sqrt{9-x^2-y^2}}$

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

$= -y \cdot \frac{1}{\sqrt{9-x^2-y^2}}$

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

$\frac{\partial}{\partial r} = e^{r+s} \cdot 1 = e^{r+s}$

$\frac{\partial}{\partial s} = e^{r+s} \cdot 1 = e^{r+s}$

39 $Q = \frac{L}{M} \cdot e^{-\frac{Lt}{M}}$

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

$\frac{\partial}{\partial M} = \frac{L(Lt-M)}{M^3} e^{-\frac{Lt}{M}}$

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

47.

(a) =

$I(95,50) = 45.33 + 0.6845 \times 95 + 5.758 \times 50 - 0.00365 \times 95^2 - 0.1565 \times 50 \times 95 + 0.001 \times 50 \times 95^2$

$= 73.1913.$

(b) $\frac{\partial I}{\partial T} = 0.6845 - 0.0073T - 0.1565H + 0.001H \times 2T$

$= 1.666$

14.4.

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

$f'(x)=2xy+y^3$

$f'(y)=x^2+3y^2x$

$f'(x)=4+1=5$

$f'(y)=4+6=10$

$z-6=5(x-2)+10(y-1)$.

$z=5x-10+10y-10+6$

$=5x+10y-14$.

7. $F(r,s)=r^2s^{-\frac{1}{2}}+s^{-3}$ $(2,1)$

$F'(r)=2rs^{-\frac{1}{2}}$

$F'(s)=r^2\cdot-\frac{1}{2}s^{-\frac{3}{2}}+-3s^{-4}$

$F'(r)=4\times1=4$

$F'(s)=4\cdot(-\frac{1}{2})+(-3)$

$=-5$

$z-5=4(\cancel{x}^r-2)\cancel{+}-5(y^s-1)$

$=4\cancel{x}r-8-5ys+5$

$z=4\cancel{x}r-8-5ys+5+5$

$=4\cancel{x}r-5ys+2$

5. $f(x,y)=x^2+y^{-2}$ $(4,1)$

$f'(x)=2x\ \cancel{+0}$

$f'(y)=-2y^{-3}$

$f'(x)=\cancel{16}\,8$

$f'(y)=-2$

$z-17=8\cancel{16}(x-4)\cancel{+}-2(y-1)$

$z=8\cancel{16}x-\cancel{64}^{32}-2y+2+17$

$=8\cancel{16}x-2y-\cancel{45}\ 13$

13. $f(x,y)=x^2y^3$ $(\cancel{3}\ 2,1)$

$f'(x)=2x$

$f'(y)=\cancel{x}\,3x^2y^2$

$f(\cancel{\frac{3}{2}}2,1)=\cancel{\frac{9}{4}}\times1=\cancel{\frac{9}{4}}\ 4$

$f'(x)=4$ $f'(y)=3\times4\times1=12$

$L(x,y)=4+4(x-2)+12(y-1)$

$f(x,y)\approx4+4(x-2)+12(y-1)$

$f(2.01,1.02)=4.28$

$f(1.97,1.01)=4$

15. $f(x,y)=x^3y^{-4}$. $(2,1)$

$f'(x)=3x^2y^{-4}$

$f'(y)=-4x^3y^{-5}$

$f(2,1)=8\times1^{-4}=8$

$f'(x)=3\times4\times1^{-4}=12$

$f'(y)=-4\times8\ \cancel{\times1}$

$=-32$

$f(x,y)\approx8+12(x-2)-32(y-1)$

$f(2.03,0.9)=11.56$

$\Delta f=f(2.03,0.9)-f(2,1)$

$=11.56-8$

≈3.56

17. $f(x,y)=e^{x^2+y}$ $(0,0)$

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

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

$f(0,0)=e^0=1$

$f(x)=e^0\times 0=0$

$f(y)=e^0=1$

$L(x,y)=1+0(x-0)+1(y-0)$

$f(x,y)=1+0+y$.

$f(0.01,-0.02)=1-0.02$

$=0.98$.

23. $(2.01)^3(1.02)^2$

$=8.44$

25. $\sqrt{3.01^2+3.98^2}$

$=4.998$

27. $\sqrt{1.9\times 2.02\times 4.05}$

$=3.94$

扫描全能王 创建

14.5

7. $h(x,y,z) = xyz^{-3}$

$h_x = yz^{-3}$ $h_y = xz^{-3}$

$h_z = \cancel{xy} - 3z^{-4}xy$

$\nabla h = \langle yz^{-3}, xz^{-3}, -3z^{-4}xy \rangle$

11. $f(x,y) = x^2 - 3xy$

$r(t) = \langle \cos t, \sin t \rangle$ $t=0$

$x = \cos t$ $y = \sin t$

$f(r(t)) = \cos^2 t - 3\cos t \sin t$

$\frac{d}{dt} f(r(t)) = -2\sin x \cos x - 3\cos^2 t$

$t=0$ $\frac{d}{dt} f(r(t)) = -3.$

13. $f(x,y) = \sin(xy)$ $r(t) = \langle e^{2t}, e^{3t} \rangle$

$t=0$

$x = e^{2t}$ $y = e^{3t}$

$f(r(t)) = \sin(e^{2t} \cdot e^{3t})$

$= \sin e^{5t}$

$\frac{d}{dt} f(r(t)) = 5\cos e^{5t} \cdot e^{5t}$

$t=0$

$\frac{d}{dt} f(r(t)) = 5\cos 1 \times 1$

$= 5\cos 1$

$= 4.999$

19. $g(x,y,z) = xyz^{-1}$

$r(t) = \langle e^t, t, t^2 \rangle$ $t=1$

$x = e^t$ $y = t$ $z = t^2$

$g(r(t)) = e^t \cdot t \cdot (t^2)^{-1}$

$= e^t \cdot t \cdot \frac{1}{t^2}$

$\cancel{= e^t \cdot \frac{1}{t}}$

$\cancel{\frac{d}{dt} = f}$ $\frac{d}{dt} g(r(t)) = e^t \cdot 1(-2t^{-3})$

$t=1$

$\frac{d}{dt} g(r(t)) = e^1 \cdot \cancel{(-1^{-2})} -2 \times 1^{-3}$

$= -5.44$

27. $f(x,y) = \ln(x^2+y^2)$

$V = 3i - 2j$ $P = (1,0)$

$f_x = \frac{2x}{x^2+y^2}$ $f_y = \frac{2y}{x^2+y^2}$

$\nabla f = \langle \frac{2x}{x^2+y^2}, \frac{2y}{x^2+y^2} \rangle$

$|\langle 3, -2, 0 \rangle| = \sqrt{9+4+0} = \sqrt{13}$

$u = \langle \frac{3}{\sqrt{13}}, \frac{-2}{\sqrt{13}} \rangle$

$\nabla f(1,0) = \langle \frac{2}{1}, 0 \rangle = \langle 2, 0 \rangle$

$\nabla f \cdot u = \cancel{\frac{3}{\sqrt{13}}} \frac{6}{\sqrt{13}} + 0 = \frac{6}{\sqrt{13}}$

31. $f(x,y) = x^2 + 4y^2$ $P = (3,2)$

$\nabla f = \langle 2x, 8y \rangle$

$[0,0] - [3,2] = \langle -3, -2 \rangle$

$|\langle -3, -2 \rangle| = \sqrt{13}$

$u = \langle \frac{-3}{\sqrt{13}}, \frac{-2}{\sqrt{13}} \rangle$

$\nabla f(3,2) = \langle 6, 16 \rangle$

$\nabla f \cdot u = \frac{-18}{\sqrt{13}} + \frac{-32}{\sqrt{13}} = -\frac{50}{\sqrt{13}}$

35.

$5-3=2$

$7-9=2$

$3-4=-1$

$v=\langle 2,-2,-1\rangle$

$\nabla T=\langle e^{y-z}, xe^{y-z}, -xe^{y-z}\rangle$

$|v|=\sqrt{4+4+1}=3$

$u=\langle \frac{2}{3}, -\frac{2}{3}, -\frac{1}{3}\rangle$

$\nabla T=\langle e^5, 3e^5, -3e^5\rangle$

$\frac{2}{3}e^5-\frac{6}{3}e^5+e^5$

$=-e^5$

37.

$D_u=\langle 2,-4,4\rangle\cdot\langle 2,1,3\rangle/\sqrt{4+1+9}$

$=2\times 2-4+12/\sqrt{4+1+9}$

$=4-4+12/\sqrt{4+1+9}$

$=12/\sqrt{4+1+9}$

increasing because the directive Direction is positive.

39. I know the way to do it, but don't how to calculate ~~the~~ $\mp$ with the π.

41. $x^2+y^2-z^2=6$ $(3,1,2)$.

$f_x=2x$

$f_y=2y$

$f_z=-2z$

$\cancel{f_x}$ $f: \langle 2x, 2y, -2z\rangle$

$\langle 2\times 3, 2\times 1, -2\times 2\rangle$

$\langle 6, 2, -4\rangle$.

43. $\frac{x^2}{4}+\frac{y^2}{9}+z^2=1$ $(1,1,-2)$

$\frac{x}{2}+\frac{2y}{9}+2z=1$

$\text{grad } f_0=\langle \frac{x}{2}, \frac{2}{9}y, 2z\rangle = c\langle 1,1,-2\rangle$

$\frac{x}{2}=c$ $\frac{2y}{9}=c$ $\cancel{zc=}\ 2z=-2c$ seems incorrect.

$x=2c$ $y=\frac{9c}{2}$ $z=\cancel{-z}c$

$\frac{2c}{2}+\frac{2}{9}\cdot\frac{9}{2}c\ \cancel{\pm}\ 2c=1$

$c+c\ \cancel{+2c}=\cancel{1}\ 0$

$\cancel{c=\frac{1}{4}}$