Fayed Razo
10/11/2020

14.6: 1, 3, 5, 7, 15, 23, 27, 29, 31

1. $f(x,y,z) = x^2y^3 + z^4$

a. $\frac{\partial f}{\partial x} f(x,y,z) = 2xy^3$

$\frac{\partial f}{\partial y} f(x,y,z) = 3y^2x^2$

$\frac{\partial f}{\partial z} f(x,y,z) = 4z^3$

b. $\frac{\partial x}{\partial s}\ x = 2s \quad \frac{\partial y}{\partial s}\ y = t^2 \quad \frac{\partial z}{\partial s}\ z = 2st$

c. $s^4 s^3 t^6 \quad (s^2t)^4$

$s^7t^6 + s^8t^4$

$\frac{\partial f}{\partial s} = 7s^6t^6 + 8s^7t^4$

$f(x,y,z) = xy + z^2, \quad 2rs^3 + r^4$

3. $\dfrac{\partial f}{\partial s} f(x,y,z) = 6rs^2$

$\dfrac{\partial f}{\partial r} f(x,y,z) = 2s^3 + 4r^3$

5. $g(x,y) = \cos(x-y)$

$= \cos(3u - 5v + 7u - 15v)$

$= \cos(10u - 20v)$

$\dfrac{\partial g}{\partial y} g(x,y) = -10\sin(10u - 20v)$

$\dfrac{\partial g}{\partial v} g(x,y) = 20\sin(10u - 20v)$

7. $F(u,v) = e^{u+v}$ $\quad u = x^2$

$v = xy$

$= e^{x^2+xy}$

$\frac{\partial F}{\partial y} e^{x^2+xy} = x e^{x^2+xy}$

15 $e^{2u}\cos^2 v - e^{2u}\sin^2 v$

$2e^{2u}\cos^2 v - 2e^{2u}\sin^2 v$ $y+$

$2\cos^2 v - 2\sin^2 v = 2\cos 2$

23 $f(x,y) = 2xy$ $\frac{\partial f}{\partial s} = 1$

$\partial x = 2y$

$(2(s+t))^2 - (2(s-t))^2$ $\frac{\partial f}{\partial t} = -1$

$(s+t)^2 4 - (s-t)^2 4 =$

27.

$$-\frac{2xy+z^2}{y^2+2zx}$$

$F_z = y^2+2zx$

$F_x = 2xy+z^2$

29. $$-\frac{xe^{xy}+1}{x\cos(xz)}$$

$F_z = x\cos(xz)$

$F_y = xe^{xy}+1$

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

$F_w = -(w^2+x^2)^{-2}(2w)$

$-(w^2+y^2)^{-2}(2w)$

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

31. $$-\frac{y(w^2+y^2)}{w((w^2+y^2)^2+(w^2+x^2)^2)}$$

$F_y = \cancel{(w^2+x^2)^{-1}}+(w^2+y^2)^{-1}=1$

$-(w^2+y^2)^{-2}\,2y$

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

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

15.7: 1, 3, 5, 7, 11, 13, 19, 21, 23, 29, 35

1.

a. $f(0,0) = 0+0-4(0)(0) = 0$

$f(2\sqrt{2}, 2\sqrt{2}) = 8+4-9 = 4$ same for $(-2\sqrt{2}, -\frac{\sqrt{2}}{2})$

b. Sadle point, local minimum

$(0,0)$ $(2\sqrt{2}, 2\sqrt{2})$

$(-2\sqrt{2}, -2\sqrt{2})$

3. $(0,0)$ sadde point

$(\frac{13}{64}, -\frac{13}{32})$ and $(-\frac{1}{4}, \frac{1}{2})$ local minima

5.

a.

$y(y-2x+1)=0$ $y=0$ $f(0,0) = 0^2-0+0=0$

$x(2y-x+1)=0$ $y=0$ $f(0,0) = x-0+0+0=0$

b. $y'=1$ $y=2x+1$ $x=0$

$y'=-2$

$y=\frac{x-1}{2}$ $1\frac{1}{2}$

c. $=0$ 0 $y''=-2>0$

-2 0 $x''>0$ Sadle pint: $(0,0)$, $(1,0)$, $(1,\ldots$ and $(0,-1)$

$0, 1, 0$ Localmin: $(\frac{1}{3}, -\frac{1}{3})$

7. $f'_x(x,y) = 2x - x + 1$

$= x + 1 \quad x = -1$

$f'_y(x,y) = 2y - y \quad y = 0$

$f_{xx}(x,y) = 1 > 0$ Local min: $(-1, 0)$

$f_{yy} = -1 < 0$ Local max: $(0, 0)$

11. $f_x(x,y) = 4 - 9x^2 - y^2$

$f_y(x,y) = y^2 \quad y = 0$

Sadle point $(0, \pm\sqrt{2})$

$f_{xx}(x,y) = -18x$

$f_{yy}(x,y) = -1$

Local min: $(\frac{2}{3}, 0)$

Local max: $(-\frac{2}{3}, 0)$

19. $f_x(x,y) = \frac{1}{x} - 1$

$\frac{1}{x} = 1$

$x = 1$

local max $(1, \frac{1}{2})$

$f_{xx}(x,y) = -\frac{1}{x^2}$

$f_y(x,y) = -4$

$f_{yy}(x,y) = 0$

23. $f_x(x,y) = e^{y-x^2} - 2x(x+3x)e^{y-x^2}$

$f_{xx}(x,y) = -2xe^{y-x^2}(-2x)(x+3x)e^{y-y^2} + (1-2y)(-2x)(y+3y)(e^{y-y})$

$f_y(x,y) = 3e^{y-x^2} + (1-x^2)e^{y-x^2}(x+3x)$ $y = -\frac{1}{6}$

$f_{yy}(x,y) = 3e^{y-x^2}$

$(-\frac{1}{6}, -\frac{17}{18})$ local min

2a. $f_x(x,y) = 1$

$f_{xx}(x,y) = 0$

Global max: 2

Global min: 0

$f_y(x,y) = 1$

$f_{yy}(x,y) = 0$

3.

a. $f_x(x,y) = 1 - 2x - x = 1 - 3x$

$x = \frac{1}{3}$

$f_y(x,y) = 1 - 2x - y = 1 - 3y \quad y = \frac{1}{3}$

$\frac{2}{3} - \frac{1}{9} - \frac{1}{9} - \frac{1}{9}$

b. $x(x-1)$

$x = 0$

$y = 1$

extreme value: $\frac{1}{3}$

$\frac{4}{9} - \frac{3}{9} = \frac{1}{3}$

c.

extreme value $\frac{1}{3}$

c.

d. $\frac{1}{3}$ extreme max

21. $f_x(x,y) = 1 - \frac{1}{x+y}$

$f_y(x,y = -2y - \frac{1}{x+y}$

There is none.

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

$2y(x+y = -1$

$2xy+2y^2 = -1$