Ex 13.8

Q1)

1).(a). $(x-2)^2+(y+1)^2$

Ans: $f'(x,y) = 2(x-2) = 0 \quad 2x-4=0 \quad x=2$

$f'(x,y) = 2(y+1)$

C.P: $(2,-1)$. $y=-1$

$f'_{xx} = 2$, $f_{xy}=0$ $D = 4>0, f_{xx}>0$

$f_{yy} = 2$ so Relmin at $(2,-1)$ ☐

(b). $f'(x,y) = -2x = 0$

Ans: $f'(x,y) = -2y = 0$ C.P $(0,0)$

$f'_{xx} = -2, f_{yy} = -2, f_{xy} = 0$ so Relmax at $(0,0)$.

(c). $f'(x,y) = 1$ $(0,0)$

Ans: $f'(x,y) = 2$ $(1)(2) - 0 = 0$

No, Min, Max, inconclusive

Q2)

(a). $f'(x,y) = -2x -$

Ans: $-2(x+1) = 0 \rightarrow -2x - 2 = 0$

$f'(x,y) = -2(y-5) = 0$ $x=-1$

$-2y+10 = 0$ $(-1,5)$

$y=5$

(b). $f'_{xx} = -2, f_{yy} = -2, f_{xy} = 0 \rightarrow$ So Relmax at $(-1,5)$.

$f'(x,y) = ye^{xy} = 0 \rightarrow y=0$ C.P $(0,0)$.

$f'_y = xe^{xy} = 0 \rightarrow x=0$ So (0) inconclusive

(c). $f(x,y) = 2x - 2y = 0$

$f'(x,y)$ $y=x$ $x=0$ C.P $(0,0)$

$= -2y = 0$ $y=0$

$f_{xx} = 2, f_{yy} = -2$

$(2)(-2) - (0)^2 = (4)$

Saddle Point at $(0,0)$.

Q9).

Ans: $f_x = y+2 \rightarrow = 0 \quad y=-2$

$f_y = 2y + x + 3 = 0$

$2(-2) + x + 3 = 0$ $(1,-2)$

$x=1$

$f_{xx} = 0$, $f_{xy} = 1$

$f_{yy} = 2$ Saddle Point at $(1,-2)$.

Q10).

Ans: $f_x = 2x + y - 2 = 0 \quad 2(2) + y - 2 = 0$

$f_y = x - 2 = 0$ $y=-2$

$x=2$ C.P $(2,-2)$

$f_{xx} = 2$ $f_{xy} \rightarrow (1)$ Saddle Point at $(2,-2)$

$f_{yy} = 0$

Q11). $f_x = 2x + y - 3 = 0$

$f_y = x + 2y = 6$

$x = -2y \rightarrow x = 6/5$

$-4y + y - 3 = 0$ $(6/5, -3/5)$

$-5y - 3 = 0$

$y = -3/5$

$f_x = 2$

$f_{yy} = 2$

(2)(2) - (1) → (3) So Relmax at

Bazilwaddin-Ikram 246-0559 H. Date

Q12). $f_x = y - 3x^2 = 0 \rightarrow y = 3x^2$; $f_y = x - 2y = 0$; $x = 2y$

C.P $\rightarrow (0,0), (\frac{1}{12}, \frac{1}{6})$

$f_{xx} = -6x$; $f_{yy} = -2$; $f_{xy} = 0$

$y - 3(4y)^2 = 0$; $-y + 24y^2 = 0$; $y(-1 + 24y) = 0$; $y = 0, y = 1/12$; $x = 0$; $y = 1/6$

$(-6x)(-2) - (0)^2$

At $(0,0)$ its inconclusive, At $(\frac{1}{6}, \frac{1}{12})$ it's saddlepoint.

Q13).

Ans: $f_x = 2x - \frac{2}{x^2 y} = 0 \rightarrow 2x = \frac{2}{x^2 y}$; $x^3 y = 1$; $y = \frac{1}{x^3}$

$f_y = 2y - \frac{2}{xy^2} = 0$; c.p $(1,1), (-1,-1)$

$2y = \frac{1}{x(\frac{1}{x^6})}$; $2x - x^3 = 0$; $x^3(2x^2 - 1) = 0$; $x^2 = \frac{1}{2}$; $x = \pm \frac{1}{\sqrt{2}}$

$\therefore$ At $\rightarrow (1,1)$ & $(-1,-1)$ Relu min

Q14). $f_x = e^y$; $e^y = 0$; y cannot be $\ln 0$; $y = \infty$

$f_y = xe^y$

$f_x = 0$

Q15) $f_x = 2x$

Ans: $f_y = 1 - e^y$; $2x = 0$; $x = 0$; $1 - e^y$; $y = 0$; C.P $(0,0)$

$f_{xx} = 2$; $f_{yy} = -e^y$; $(2)(-1) - (0) \rightarrow -1$ saddle Point.

Q17). $e^x \sin y$

$f_x = e^x \sin y$; $f_y = e^x \cos y$; No c.p. $\therefore$

Q18) $y \sin x$

$f_x = y \cos x = y = 0$; $f_y = y \sin x = 0$; $x = \pi/2$; $(\frac{\pi}{2}, 0)$ $\therefore$ saddlepoint

$f_{xx} = -y \sin x$; $f_{yy} = \cos x$; $f_{xy} = \cos x$

$(0)(-1) - (1)^2 = -1$; < 0 saddle.

Q16). $f_x = y - \frac{2}{x^2} = 0 \rightarrow y = \frac{2}{x^2}$

$f_y = x - 4/y^2 = 0$

$x = \frac{4}{y^2} \rightarrow x = \frac{4}{(\frac{4}{x^4})} \rightarrow x = x^3$; $x^3 - x = 0$; $x(x^2 - 1) = 0$; $x = 0, x = -1, x = 1$

C.Por $(1,2), (-1,2)$

$f_{xx} = +\frac{4}{x^3}$, $f_{yy} = +\frac{8}{y^3}$, $f_{xy} = 1$

for $\rightarrow (1,2) \rightarrow (\frac{4}{1^3}) \times (\frac{8}{(2)^3}) - (1) \rightarrow$ 3So Relmin

for $(-1,2) \rightarrow (-4) \times (\frac{8}{8}) - (1) \rightarrow$ Saddle Point

GENIUS