Hand out Section 11.7

Total 9 pts

6. $f(x,y) = x^3y + 12x^2 - 8y$

$f_x = 3x^2y + 24x = 3x(xy+8)$

$f_y = x^3 - 8$

Only critical point is at $(2,-4)$

1 pt $f_{xx}(2,-4) = 6xy + 24 \Big|_{(2,-4)} = -24$

$f_{yy}(2,-4) = 0$

$f_{xy} = f_{yx} = 3x^2 \Big|_{(2,-4)} = 12$

$D = \begin{vmatrix} -24 & 12 \\ 12 & 0 \end{vmatrix} = -144$ $\therefore$ neither local max or min.

7. $f(x,y) = x^2 + y^2 + x^2y + 4$

$f_x(x,y) = 2x + 2xy = 2x(1+y)$

$f_y(x,y) = 2y + x^2$

Critical Points: $(0,0)$ and $(\sqrt{2},-1)$ and $(-\sqrt{2},-1)$

evaluated at	$(0,0)$	$(\sqrt{2},-1)$	$(-\sqrt{2},-1)$
$f_{xx} = 2+2y$	2	0	0
$f_{yy} = 2$	2	2	2
$f_{xy} = f_{yx} = 2x$	0	$2\sqrt{2}$	$-2\sqrt{2}$

1 pt

D $\begin{vmatrix} 2 & 0 \\ 0 & 2 \end{vmatrix}$ $\begin{vmatrix} 0 & 2\sqrt{2} \\ 2\sqrt{2} & 2 \end{vmatrix}$ $\begin{vmatrix} 0 & -2\sqrt{2} \\ -2\sqrt{2} & 2 \end{vmatrix}$

$= 4$ $= -8$ $= -8$

So the only ~~critical point~~ local max or min is $(0,0)$; it's a local min because $f_{xx} > 0$.