17 $f(x,y) = 4y^4 - 32y^2 + 8x^2 - 16$

$f_x(x,y) = 16x$

$f_y(x,y) = 16y^3 - 64y$

$16x = 0 \Rightarrow x = 0$

$16y^3 - 64y = 0 \Rightarrow 16y(y^2 - 4) = 0$

$\Rightarrow y = 0, 2, -2$

$\therefore$ Critical points: $(0,0), (0,2), (0,-2)$

$f_{xx}(x,y) = 16$

$f_{yy}(x,y) = 48y^2 - 64$

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

$D(0,0) = f_{xx}(0,0) \cdot f_{yy}(0,0) - [f_{xy}(0,0)]^2$

$= 16 \cdot (-64) - 0^2 = -1024 < 0$

$\therefore f(0,0)$ is a saddle point

$D(0,2) = f_{xx}(0,2) \cdot f_{yy}(0,2) - [f_{xy}(0,2)]^2$

$= 16 \cdot 128 - 0^2$

$= 2048 > 0$

$f_{xx}(0,2) = 16 > 0$

$\therefore (0,2)$ is a point of local minimum

Local min $= f(0,2)$

$= 4 \cdot 2^4 - 32 \cdot 2^2 - 8 \cdot 0^2 - 16$

$= 64 - 128 - 16$

$= -80$

$D(0,-2) = f_{xx}(0,-2) \cdot f_{yy}(0,-2) - [f_{xy}(0,-2)]^2$

$= 16 \cdot 128 - 0^2 = 2048 > 0$

$f_{xx}(0,-2) = 16 > 0$

$\therefore (0,-2)$ is a point of local minimum

Local min $= f(0,-2)$

$= 4 \cdot (-2)^4 - 32(-2)^2 + 8 \cdot 0^2 - 16$

$= 64 - 128 - 16$

$= -80$