Math 208
Second derivative test additional problems

Find and classify (as local maxima, local minima, or saddle points) the critical points of the following functions.

1. \( f(x, y) = 8x^2 + 4x^2y + y^2 - 7 \)

2. \( f(x, y) = xy^2 - 2y^2x + 2xy \)

3. \( f(x, y) = 4y^3 - y^4 + 8xy - 2x^2 \)

4. \( f(x, y) = 9x^2 + y^2 - \frac{54}{xy} \)
Answers:
1. Local min at (0,0), saddle points at (1,-2) and (-1,-2).
2. Saddle points at (0,0), (0,1) and (-2,0); local min at (-\(\frac{3}{2}\),\(\frac{1}{3}\)).
3. Saddle point at (0,0), local max at (-2,-1) and at (8,4).
4. Local mins at (1,-3) and (-1,3).