**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. $f(x,y) = yx^2 - 2y^2x + 2xy$

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 $(-\frac{2}{3},\frac{1}{3})$.
3. Saddle point at $(0,0)$, local max at $(-2,-1)$ and at $(8,4)$.
4. Local mins at $(1,-3)$ and $(-1,3)$.