Math 2551 Worksheet Section 14.7

1. Find all the local maxima, local minima, and saddle points of $f(x,y) = e^y(x^2 - y^2)$.

2. Find the absolute maxima and minima of the function $f(x,y) = x^2 - xy + y^2 + 1$ on the closed triangular plate bounded by lines $x = 0$, $y = 4$, $y = x$ in the first quadrant.

3. Among all rectangular boxes of volume 27 cm^3, what are the dimensions of the box with the smallest surface area? What is the smallest possible surface area? (assume this occurs at a local min of the surface area function)

4. In each case, the origin is a critical point of f and $f_{xx}f_{yy} - (f_{xy})^2 = 0$ at the origin, so the Second Derivative Test fails at the origin. Use some other method to determine whether the function f has a maximum, a minimum, or neither at the origin.

   (a) $f(x,y) = x^2y^2$

   (b) $f(x,y) = 1 - x^2y^2$

   (c) $f(x,y) = xy^2$

   (d) $f(x,y) = x^3y^2$

   (e) $f(x,y) = x^3y^3$

   (f) $f(x,y) = x^4y^4$