Name _____ Section A, C, D 10

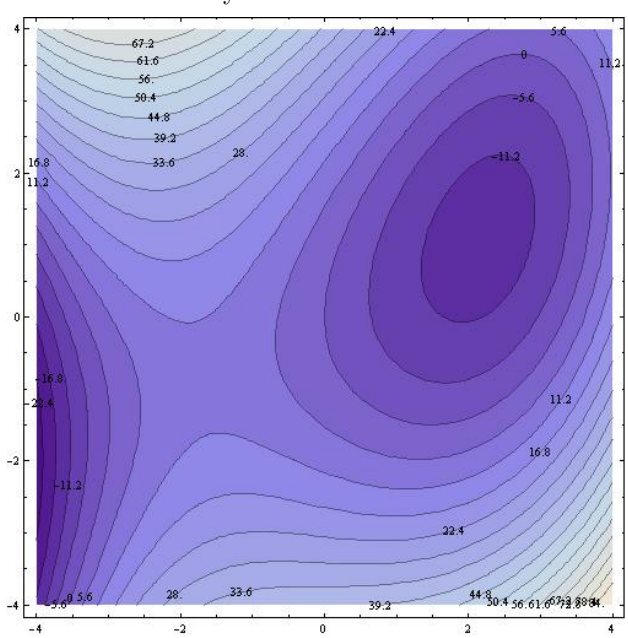
MA 104, Quiz #7 1 May, 2008

Instructions: The quiz is worth 15 points. You are allowed to use basic issued calculator for this quiz. Show all work for full credit. Good luck!

Second Derivative Test:
Suppose that M is the discriminant such that:
$M = f_{xx}(a,b)f_{yy}(a,b) - (f_{xy}(a,b))^2$
If $M > 0$ and $f_{xx}(a,b) > 0$ then $f(a,b)$ is a local minimum.
If $M > 0$ and $f_{xx}(a,b) < 0$ then $f(a,b)$ is a local maximum.
If $M < 0$ then $f(a,b)$ is neither a local max or min.

1. Find the absolute maximum and minimum values of the function $f(x,y) = x^3y + 12x^2 - 8y$ along the boundary given by $y = \dfrac{1}{x}$ when $\dfrac{1}{4} \leq x \leq 1$.

2. From the contour plot below, approximate all critical points in the viewing window and classify them.



3. The following *Mathematica* code is used to find critical points and all second partial derivatives at those points. What does it tell you about $f(x, y)$?

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In[86]:= sol = Solve[{D[f[x, y], x] == 0, D[f[x, y], y] == 0}, {x, y}]
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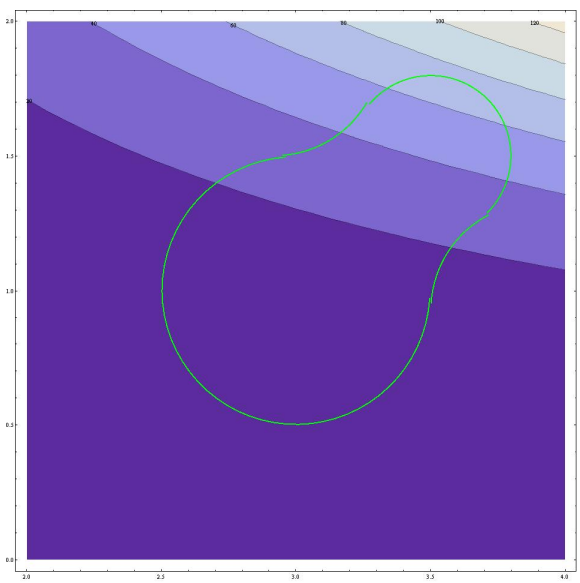
Out[86]= $\left\{\{x \to 0,\ y \to 0\},\ \left\{x \to 0,\ y \to \frac{1}{9}\right\},\ \left\{x \to \frac{1}{3},\ y \to 0\right\},\ \left\{x \to \frac{1}{3},\ y \to \frac{1}{9}\right\}\right\}$

```
In[87]:= fxx[x, y] /. sol
Out[87]= {2, 2, -2, -2}

In[88]:= fyy[x, y] /. sol
Out[88]= {2, -2, 2, -2}

In[89]:= fxy[x, y] /. sol
Out[89]= {0, 0, 0, 0}

In[90]:= fyx[x, y] /. sol
Out[90]= {0, 0, 0, 0}
```

4. On the contour plot below, identify the absolute maximum and absolute minimum.