241 Fall 1999 Exam 3

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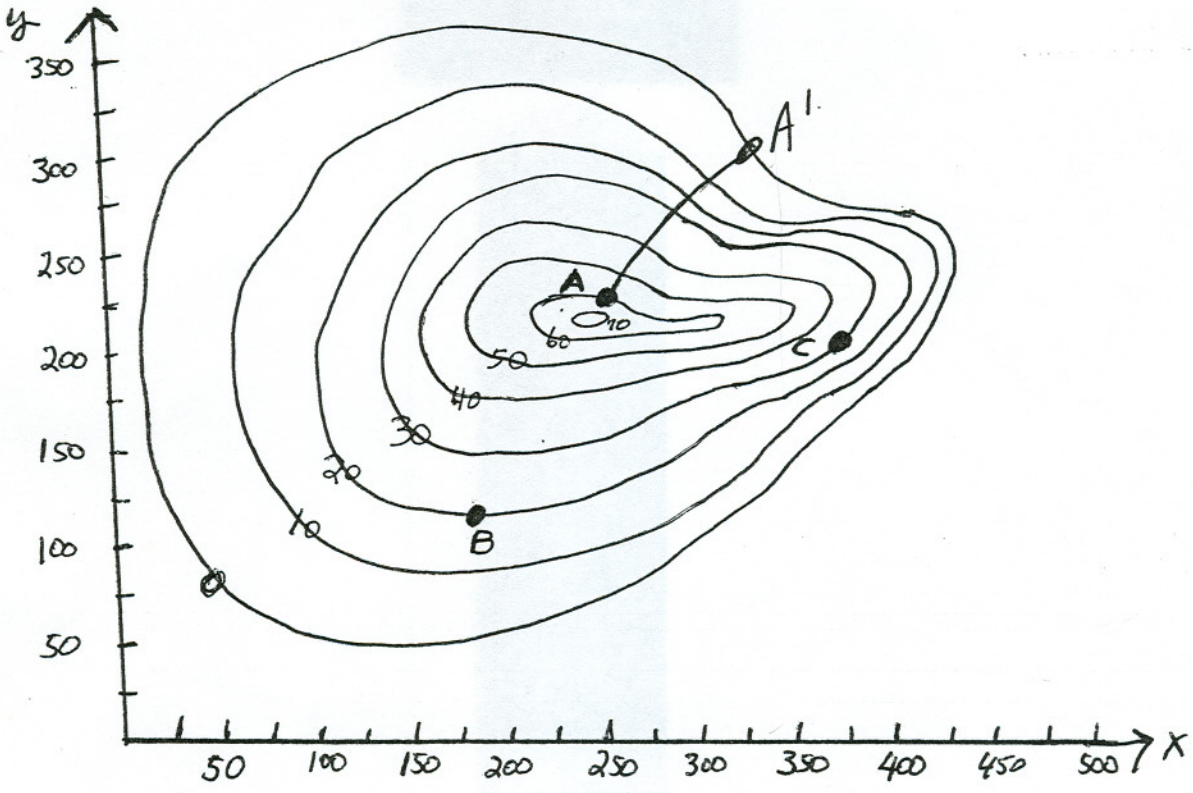
PRINT Your Name:_____

There are 10 problems on 5 pages. Each problem is worth 10 points. SHOW your work. CIRCLE your answer. **NO CALCULATORS!**

1. The picture shows the contour map for a hill 70 feet high, which we assume has the equation $z = f(x, y)$.



(a) A raindrop landing on the hill at point A will reach the xy-plane at A', by following the path of steepest descent from A. Draw the path from A to A'. My curve is $\perp$ to each level set.

(b) What are the coordinates of the point A'?

(325, 300)

(c) Estimate f_x at the point B.

$\vec{L}$ is tangent to the level set of f at B so $f_x|_B = 0$

(d) Estimate f_y at the point B.

$f_y|_B \approx \frac{\nabla f}{\nabla y} \approx \frac{10}{25}$

(e) Estimate $D_{\vec{u}} f$ at the point C, where $\vec{u} = \frac{\vec{i}+\vec{j}}{\sqrt{2}}$.

$\vec{u}$ is tangent to the level set of f at C so $D_{\vec{u}} f|_C = 0$