

Time Limit: 4 minutes**Instructions:** Closed book. Closed notes. No calculator allowed.Instructions for all quizzes: **Do not discuss any aspect of this quiz with other midshipmen until after 6th period.**

Print your last name above. Also, fill in the bubble for your section.

Fill the bubble for the correct answer. Also, write your answers in any blanks provided.

Your work will not be graded unless the instructions request you show your work.

1. Let $f(x, y)$ satisfy

$$f_x(a, b) = f_y(a, b) = 0,$$

$$f_{xx}(a, b) = -2 \quad f_{yy}(a, b) = -5, \quad f_{xy}(a, b) = 3.$$

How should we classify the point (a, b) ?

- not a critical point
 - a saddle point
 - a relative minimum
 - a relative maximum
 - none of the above
2. The contour map shows the level curves $f(x, y) = k$ for $k = -1, -3, -5$. Which vector could be the gradient of f at the origin?

$\mathbf{i} + \mathbf{j}$ $2\mathbf{i} + 2\mathbf{j}$ $-\mathbf{i} + \mathbf{j}$ $-\mathbf{i} - \mathbf{j}$ $3\mathbf{i} + 3\mathbf{j}$ $\mathbf{i} - \mathbf{j}$

