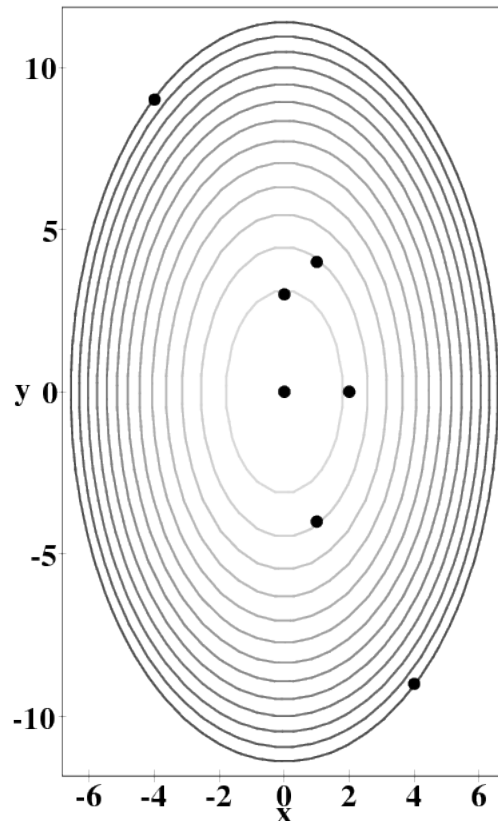


Suppose you are standing on a hill. You have a topographic map, which uses rectangular coordinates (x, y) measured in miles. Your global positioning system says your present location is at one of the following points (pick one):



A: (1, 4) **B:** (4, -9) **C:** (-4, 9) **D:** (1, -4) **E:** (2, 0) **F:** (0, 3)

Your guidebook tells you that the height h of the hill in feet above sea level is given by

$$h = a - bx^2 - cy^2$$

where $a = 5000\text{ft}$, $b = 30 \frac{\text{ft}}{\text{mi}^2}$, and $c = 10 \frac{\text{ft}}{\text{mi}^2}$.

- Starting at your present location, in what map direction (2-d unit vector) do you need to go in order to climb the hill as steeply as possible?

Draw this vector on your topographic map.

- How steep is the hill if you start at your present location and go in this compass direction?

Draw a picture which shows the slope of the hill at your present location.

- In what direction in space (3-d vector) would you actually be moving if you started at your present location and walked in the map direction you found above?

*To simplify the computation, your answer does **not** need to be a unit vector.*