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):

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

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

1. Starting at your present location, in what map direction (2-dimensional unit vector) do you need to go in order to climb the hill as steeply as possible? *Draw this vector on your topographic map.*

2. 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.*

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