

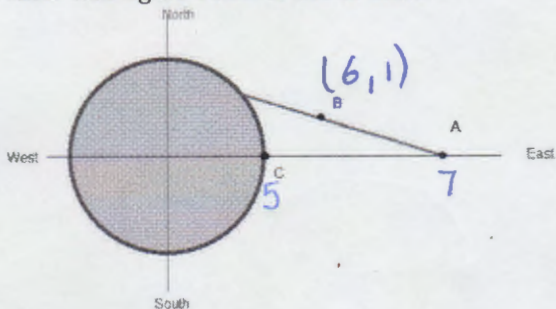
Math 124, Spring 2013, Quiz 1

April 9, 2013

Name Solutions

TA/Section \_\_\_\_\_

There is a circular lake of radius 5 miles and a path that goes around the lake. At  $t = 0$ , Kate starts riding her bike in a straight line starting at point A, 7 miles East of the center of the lake. She keeps her speed constant and at  $t = 4$  minutes, passes through the point B, 6 miles East and 1 mile North of the center of the lake. The figure below is not to scale.



1. (3 points) Find parametric equations for Kate's linear motion.

$$\begin{aligned}
 & x = at + b & y = ct + d \\
 t = 0 & \quad 7 = x = a \cdot 0 + b & \quad 0 = y = c \cdot 0 + d \\
 & \quad 7 = b & \quad 0 = d \\
 t = 4 & \quad 6 = x = 4a + 7 & \quad -1 = y = 4c + 0 \\
 & \quad -1/4 = a & \quad 1/4 = c \\
 & x = -\frac{1}{4}t + 7 & y = \frac{1}{4}t
 \end{aligned}$$

2. (3 points) When does she get to the path around the lake? What are her coordinates when she gets to the lake?

$$\text{Lake: } x^2 + y^2 = 5^2$$

$$\left(-\frac{1}{4}t + 7\right)^2 + \left(\frac{1}{4}t\right)^2 = 25$$

$$\frac{1}{16}t^2 - \frac{7}{2}t + 49 + \frac{1}{16}t^2 = 25$$

$$\frac{1}{8}t^2 - \frac{7}{2}t + 24 = 0$$

$$t = \frac{7}{2} \pm \sqrt{\frac{49}{4} - 12}$$

$$= 4 \left( \frac{7}{2} \pm \frac{1}{2} \right) = \boxed{12} \text{ or } 16$$

$$x = -3 + 7 = 4$$

$$y = \frac{12}{4} = 3$$

so (4, 3)