# Math 141 Worksheet 1

Name: *Key*

In this worksheet, you will practice using the graph of an object's position to learn about its velocity. When asked for an explanation, please write in complete sentences.

1. Consider the graph below, which shows how the positions of two bicycles (called A and B) change as time passes. The units of position are miles; the units of time are hours.

(miles)

Bike A

Bike B

(hours)

$\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1
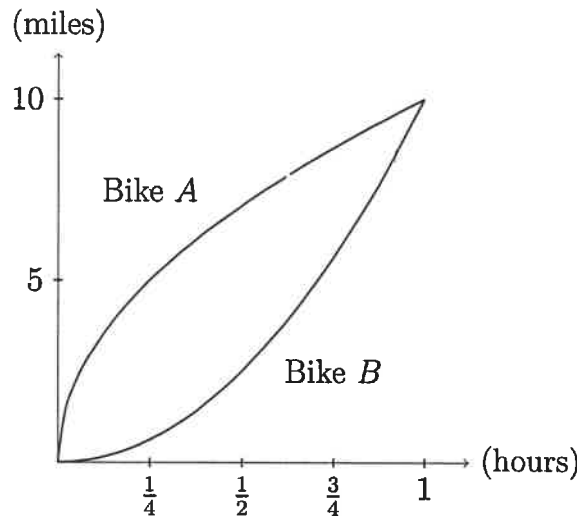
(a) Which bike is moving faster at $t = \frac{1}{4}$ (that is, after 15 minutes)? How do you know?

Bike A: close to 1/4, the distance Bike A is travelling is large than the distance Bike B is travelling

(b) Which bike is moving faster at the end of the ride (at $t = 1$)? How do you know?

Bike B: near the end, Bike B catches up to Bike A

(c) Do the bikes finish the hourlong ride together, or does one bicyclist beat the other? How can you tell?

They finish together at 1 hour, they are both 10 miles from the start.

Notice that a steeper curve on the graph corresponds to a higher velocity. A steep curve means that the position is changing a lot in a short amount of time, which means the bike is moving fast.

2. Again refer to the graph (which we've redrawn below) to answer the following questions.
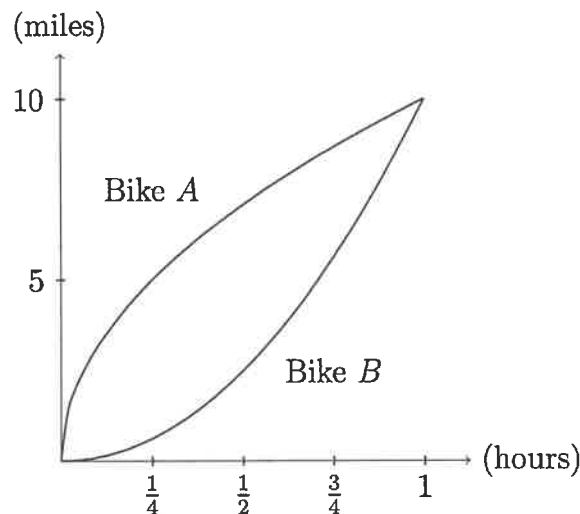
(a) According to the graph, during the last half-hour of the bike ride, when is bike A moving fastest? How do you know?

During the last half-hour, Bike B is travelling faster.
The rate at which Bike B covers distance is quicker.

(b) At about what time does bike B start catching up with bike A? That is, when does the distance between bikes A and B start to shrink?

At time t = ½, Bike B starts catching up. Two reasons:
① the line between the curves starts shortening at t = ½
② Bike B is moving faster than Bike A after t = ½

(c) Do you think there is one time when bikes A and B are moving at exactly the same velocity? Either estimate that time by looking at the graph, or explain why there can't be such a time.

Yes. Based on (a) & (b), the time they are moving at exactly the same velocity is t = ½.