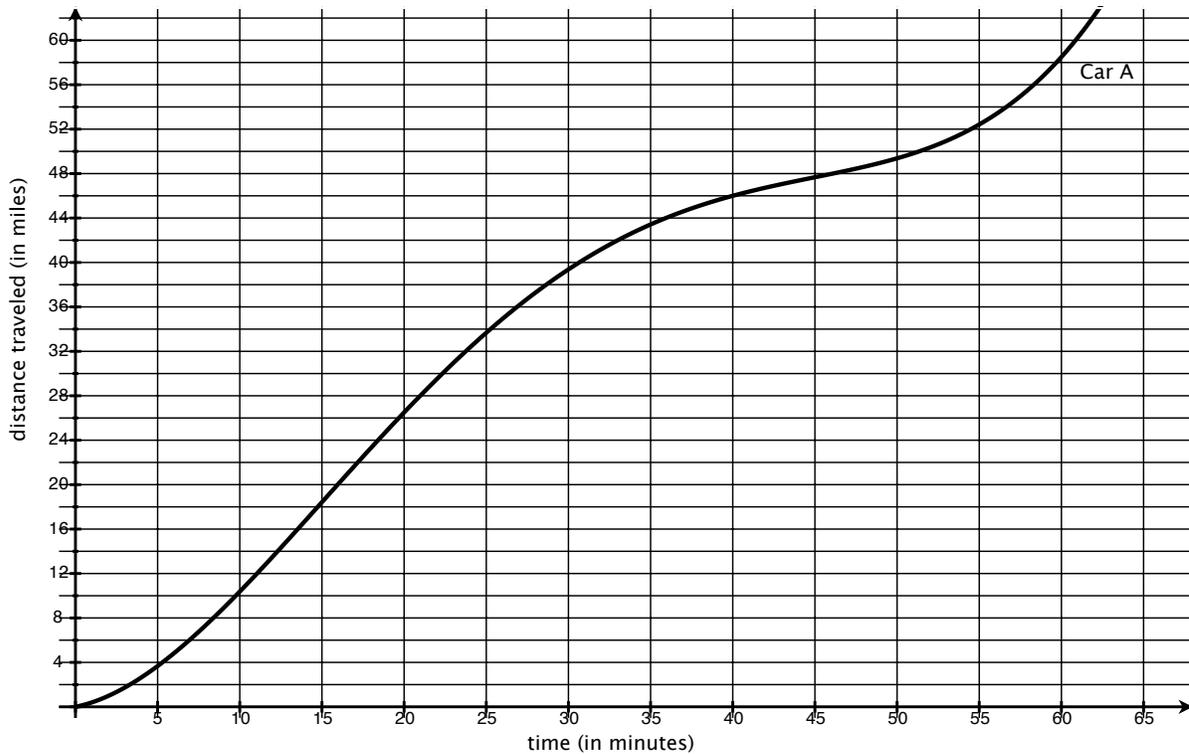# Math 111
Group Activity: More Rates of Change

1. The following is the graph of distance traveled versus time for Car A.

(a) Compute Car A's average speed during the 10-minute interval beginning at $t = 40$ minutes.

(b) Find the highest value of Car A's average trip speed. (HINT: Think about the graphical interpretation of average trip speed.)

(c) A second car, Car B, is next to Car A at $t = 0$ and travels 10 miles every 10 minutes. Give the longest time interval during which Car A is ahead of Car B. (HINT: Draw the graph of Car B's distance traveled on the axes above.)

(d) Give a 5-minute interval during which both cars have the same average speed and Car B is ahead of Car A.

2. A town is using water from a reservoir that is being refilled with a system of aqueducts. The graph below shows the total water drawn from the reservoir over the course of a day, starting at midnight.
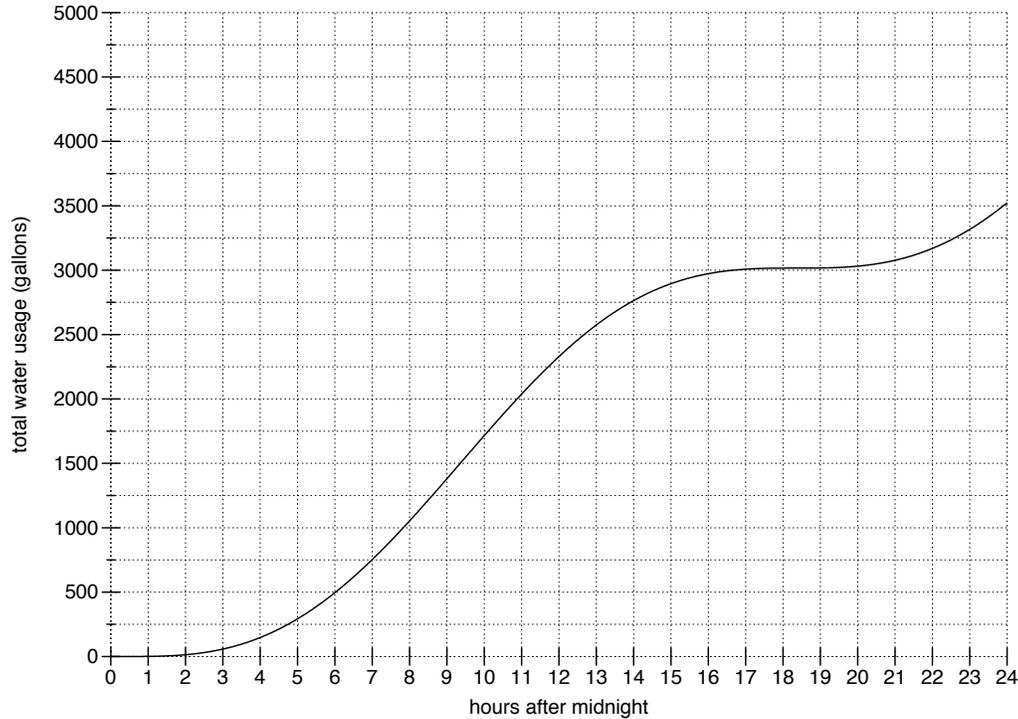
(a) Suppose the reservoir is empty at midnight and is filled by the aqueduct at a constant rate of 150 gallons per hour. Sketch a graph of the amount of water that has flowed into the reservoir on the above graph and use it to answer these questions: Will there be enough water in the reservoir to provide for the town during this 24-hour period? If not, when will there be a shortage? If the rate of flow must remain 150 gallons per hour, how much water must be in the reservoir at midnight to avoid a shortage? (HINT: How would you change the inflow graph so that there is never a shortage?)

(b) Suppose instead that the reservoir must be empty at midnight. Again, water flows into the reservoir at a constant rate. What is the smallest that rate could be to avoid a water shortage during this 24-hour period? (HINT: If water flows in at a constant rate, what does the graph of inflow look like? What feature of the inflow graph is represented by the rate of flow in? What must the inflow graph look like if there is never to be a shortage?)

(c) Suppose instead that there are 3000 gallons of water in the reservoir at midnight and that water flows in at a constant rate. What is the smallest that rate could be to avoid a water shortage during this 24-hour period?