

*Directions: Show all work, and answer each question that is asked. Explanations should be given in complete sentences. All graphs should be drawn accurately on this sheet, and be fully labeled.*

1. Rebecca drinks a cup of coffee every morning at 5:00 am. The amount of caffeine (in mg) in her body as a result of drinking this coffee is given by the function  $A(t) = 200 \left(\frac{1}{2}\right)^{t/6}$ , where  $t$  is time in hours since 5:00 am.

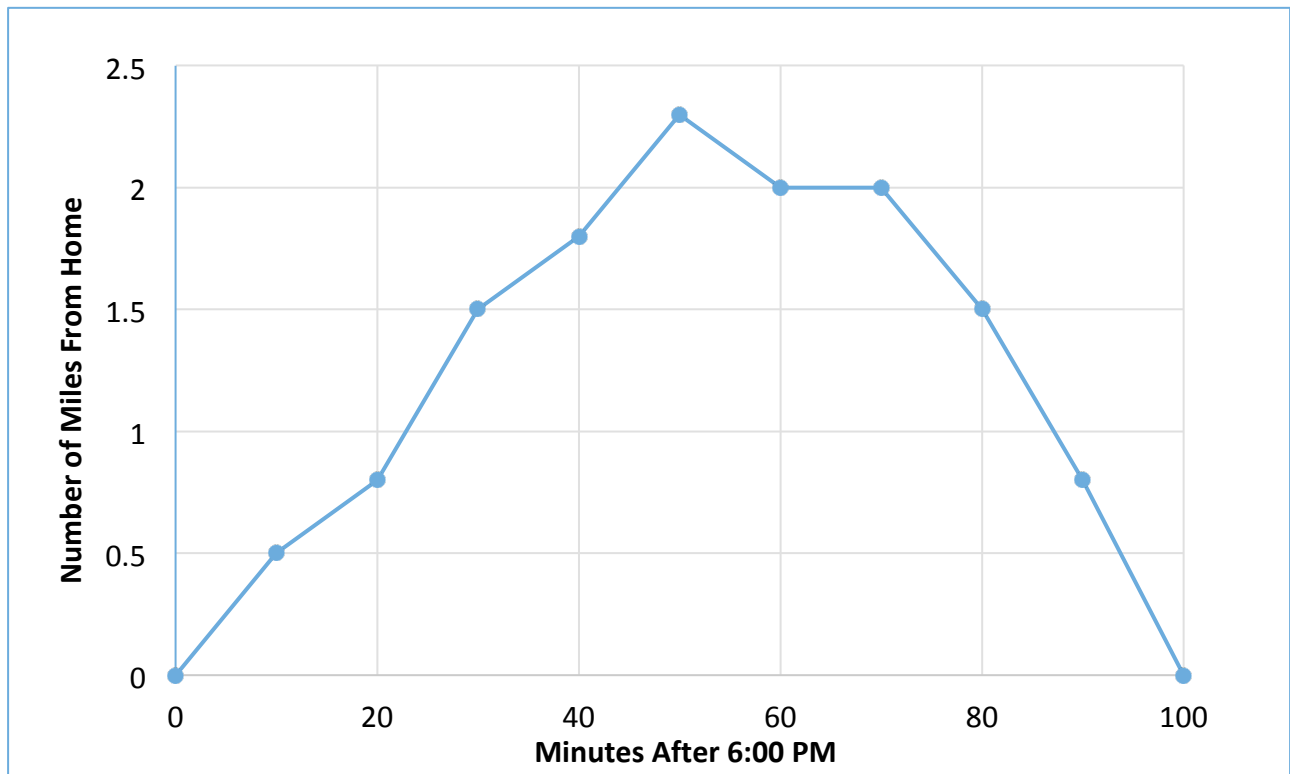
What is an appropriate domain for this function?

Sketch an accurate graph of this function in an appropriate window, labeling axes and scale.

What is the y-intercept of this function? What does this represent?

After how many hours will there be half of the original amount of caffeine left in her body, assuming she doesn't ingest any more during the day?

4. The following graph shows a jogger's distance from home as a function of the number of minutes after 6:00 pm on a particular evening.



What are the intercepts of this function, and what do they tell you in practical terms?

On what interval(s) is this function increasing? Decreasing? Constant?

Write a few sentences that could describe this jogger's trip to someone who hasn't seen this graph.

1. A solar water heater costs about \$6120 to install (after rebates). A traditional gas water heater costs about \$800, and costs about \$350 per year to run. The average annual cost to run the solar water heater is about \$70.

Create total cost functions for each of the water heaters as a function of the number of years that it is used.

Graph these functions on the same set of axes.

How many years would you need to use a solar water heater in order for the total cost to become less than the total cost of the gas water heater?

5. Alberto wants to take his phone and his video game player on a trip. An hour before they plan to leave, he realizes that he forgot to charge the batteries last night. At that point, he plugged in both devices so they can charge as long as possible before they leave. Alberto knows that his phone has 60% of its battery life left and that the battery charges by an additional 10 percentage points every 15 minutes. His video game player is new, so Alberto doesn't know how fast it is charging but he recorded the battery charge for the first 30 minutes after he plugged it in.

time charging (minutes)	0	10	20	30
video game player battery charge (%)	30	42	54	66

How much time would Alberto need to charge both of the devices fully?