1. (a) A computer is purchased for \$2816 and depreciates at a constant rate to \$0 in 8 years. Find a formula for the value, V, of the computer after t years have passed. Then use this formula to give the value of the computer after 5 years. (This is known as "straight-line depreciation" and is a depreciation model often used on tax forms).

   (b) Under this model, what is the value of the computer after 9 years? What does this mean?

   (c) What percent of the initial value does the computer lose per year?

   (d) A different model for depreciation called "double-declining balance depreciation" is used for purchases which depreciate more quickly early in their life. Here, we double the depreciation rate (from the previous part), and each year the object loses that percentage of its current value. Find a formula that fits this model, and use it to determine the value of the computer after 5 years.

   (e) What are some examples of purchases which will be better modeled by the second depreciation model?

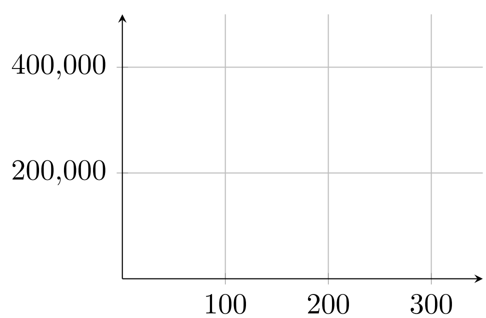
2. A light-rail system carries 80000 passengers per day at a fare of \$2.25 per ride. For each 5-cent increase in fare, surveys predict ridership will drop by 250 passengers. Call x the number of 5-cent increases.

   (a) Write a formula for the number of riders as a function of x.

   (b) Write a formula for the cost per ride as a function of x.

   (c) Write a function that gives revenue as a function of x.

   (d) Graph this function using technology.



   (e) From this graph, estimate the maximum revenue and the fare that will produce this maximum revenue.

3. Develop a formula for converting degrees Celsius to degrees Fahrenheit.

   (a) The boiling point of water at sea level, $212°F$, corresponds to $100°C$. The freezing point of water, $32°F$, corresponds to $0°C$. Use these two facts to create a linear model relating temperature in Celsius to temperature in Fahrenheit.

(b) If it is $35°C$ outside, what clothes should you wear?

(c) Is there a temperature at which the Celsius and Fahrenheit values are the same?

4. In 2000 there were about 213 million vehicles (cars and trucks) and about 281 million people in the US. The number of vehicles has been growing at 4% per year and the population has been growing at 1% per year. If the growth rates remain constant, when will there be, on average, one vehicle per person?

5. In 1969, the world record time for the mile was 4:36.8, held by Maria Gommers. In 1980, the world record was held by Mary Slaney, with a time of 4:21.7 (data from Wikipedia).

   (a) Find a linear model that fits this data, and use it to predict the world record time in 1996 and 2050.

   (b) What is the slope of your linear model? What does it represent (include units)?

   (c) If t represents the year, what is the t-intercept of your linear model? Including units, what does it represent? (A graph might help.) Comment on the validity of the model.

   (d) Using the same data, now construct an exponential model and use it to predict the world record time in 1996 and 2050.

   (e) What is the t-intercept of your exponential model? What is the end behavior, and what does it represent? (Drawing a graph might help.)

   (f) In 1996, the world record was set by Svetlana Masterkova, in a time of 4:12.56. How well did each model predict this? What do you think will happen in 2050?

   (g) Challenge: Using all the data given, find a shifted exponential model and use it to predict the record in 2050. What is the end-behavior of this model, and what does it represent?