Chapter 4:4: More Optimization and Modeling

Calculus I

College of the Atlantic. November 11, 2024

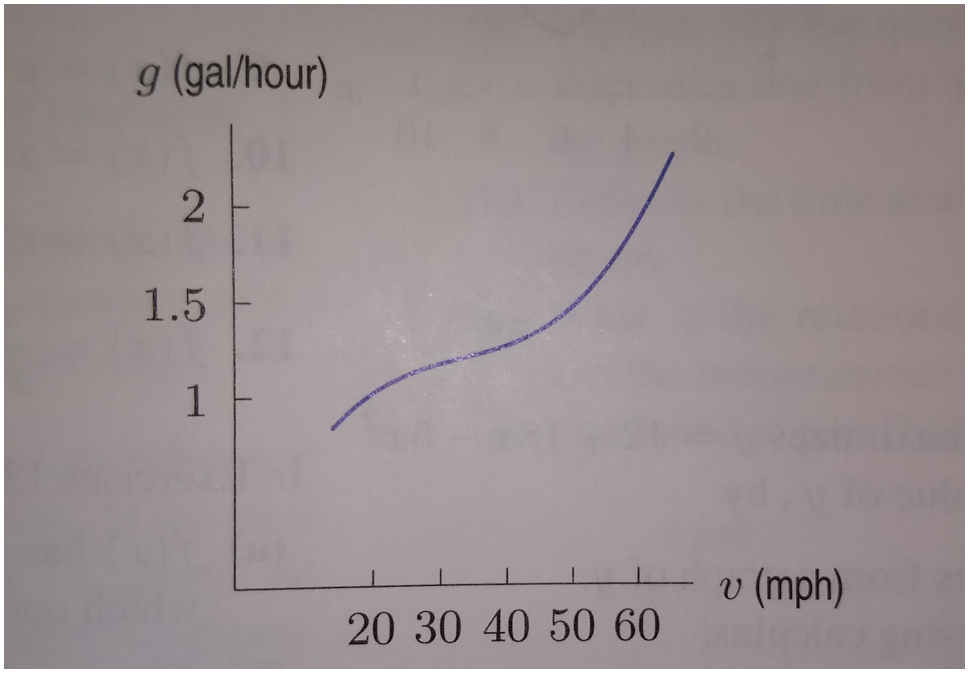

Figure 1: Gas consumption [gal/hour] as a function of speed [mi/hr].

1. Figure 1 shows the gas consumption of a car (in gal/hour) as a function of the car's speed (in miles/hour). What speed minimizes the car's consumption measured in gallons per mile?

2. You have a piece of wire of length L. You will cut this wire into two pieces. You will use one of the pieces of wire to make a circle and the other piece of wire to make a square. How should you cut the wire so that the resulting area of the two shapes is maximized?

3. What are the dimensions (height and radius) of a cylinder of volume 1000 that has the smallest surface area?

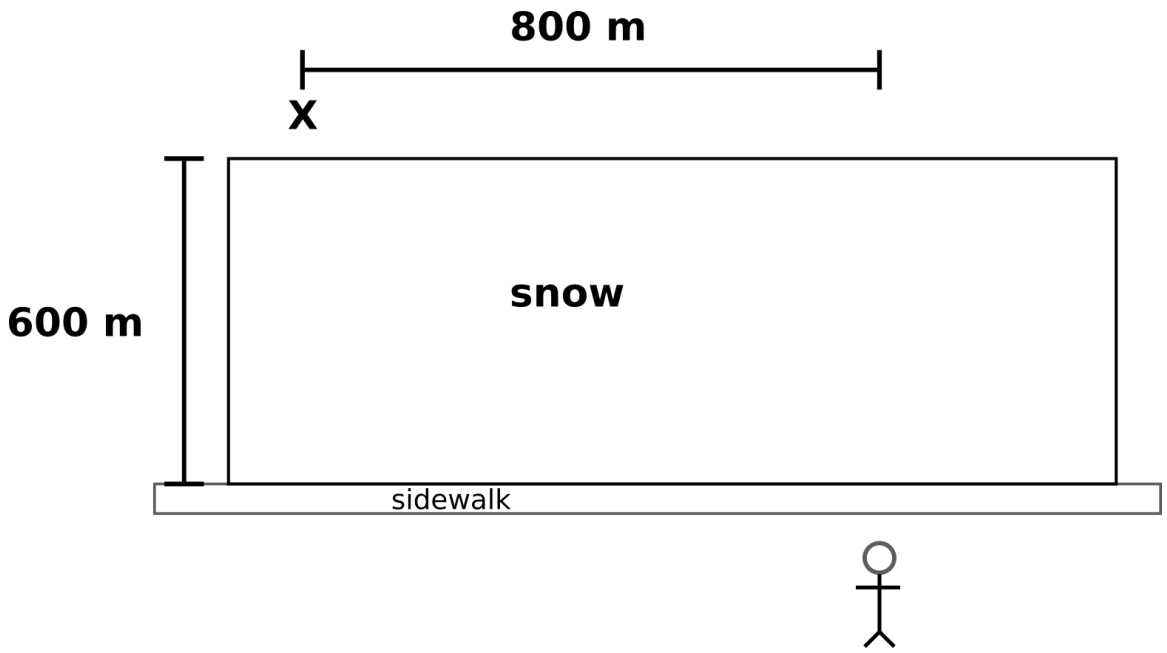

Figure 2: A sidewalk and a snowy field.

4. You need to get to point X in the figure above. (You are represented by the stick figure.) You are currently on a clear sidewalk on which you can walk at 4 m/s. But you'll have to cross the snowy field to get to point X. You can walk in the snow at a speed of 2 m/2. It is very very cold outside, so you'd like to get your destination as soon as possible. What path should you take?