**Extreme value exercises**

1. In Section 1.1 #62, we found a function that gives the cost $C$ (in dollars) for a cable as a function of a certain distance $x$ (in feet) to be

$$C(x) = 180\sqrt{x^2 + 800^2} + 100(10560 - x).$$

The relevant domain is $[0, 10560]$. Our goal is to find the distance $x$ that gives the minimum cost.

(a) Use your calculator to estimate the minimizing distance and the minimum cost.

(b) Use calculus techniques to find the minimizing distance and the minimum cost.

(c) Compare the methods from (a) and (b). What are the relative advantages and disadvantages?

(d) In our expression for $C(x)$ above, we do not keep track of units. To do so, we should write

$$C(x) = (180\ \$/\text{ft})\sqrt{x^2 + (800\ \text{ft})^2} + (100\ \$/\text{ft})(10560\ \text{ft} - x).$$

We can write this in a simpler fashion if we introduce some parameters to represent the various constants. We'll use

$$a = 180\ \$/\text{ft}, \qquad b = 100\ \$/\text{ft} \qquad r = 800\ \text{ft}, \qquad \text{and} \qquad s = 10560\ \text{ft}.$$

With these, we have

$$C(x) = a\sqrt{x^2 + r^2} + b(s - x).$$

Find the minimizing distance using this expression.

2. Find the global minimum and global maximum for $f(x) = xe^{-kx}$ on $[0, 10/k]$ where $k$ is a positive constant.

3. Find the global minimum and global maximum for $f(x) = x + \dfrac{B}{x}$ on $[0, 4\sqrt{B}]$ where $B$ is a positive constant.