Purpose: In this problem set, you will improve your understanding of logarithmic functions by studying their applications.

1. The normal healing of wounds can be modeled by an exponential function. If A_0 represents the original area of the wound and if A equals the area of the wound after n days, then the formula

$$A = A_0 e^{-0.35n}$$

describes the area of the wound on the nth day following an injury when no infection is present to slow the healing. Suppose a wound initially had an area of 100 square centimeters.

(a) If healing is taking place, how large should the area of the wound be after 3 days?

(b) How large should it be after 10 days?

(c) How many days will it take before the wound is 11 square centimeters?

2. Let R be the percent of viewers who respond to a television commercial for a new product after t days. We can find R by using the formula

$$R = 70 - 100e^{-0.2t}.$$

(a) What percent is expected to respond after 10 days?

(b) How many days until 40% of the viewers have responded?

3. Suppose a single pane of glass obliterates 10% of the light through it. If P is the percent of light that passes through and n is the number of successive panes of glass, then we can find P using the equation

$$P + 100e^{-0.1n}.$$

(a) Find the number of panes of glass needed to successfully block 50% of the light.

(b) What percent of the light is blocked by 4 panes of glass?

4. A pizza baked at 450°F is removed from the oven at 5:00 PM into a room that is a constant 70°F. After 5 minutes, the pizza is 300°F. We can model the current temperature of the pizza using the equation

$$U = T + (U_0 - T)e^{kt},$$

where T is the room temperature, U_0 is the initial temperature of the pizza, t is time, and k is the cooling constant.

(a) Find k.

(b) When should you eat the pizza if the ideal temperature for your first bite is 135°F?