CHAPTER 7 PRACTICE QUESTIONS

Directions: Complete the following open-ended problems as specified by each question stem. For extra practice after answering each question, try using an alternative method to solve the problem or check your work.

1. The formula below represents the distance modulus of a star, or the difference between the star's apparent magnitude (how bright it appears from Earth), m, and its absolute magnitude (how bright it actually is), M, in terms of d, the distance of the star from Earth, in parsecs.

$$m - M = 5\log_{10}(d - 5)$$

Write a formula that gives d in terms of m and M. If one parsec is equal to about 3.26 light-years, then what equation produces distance D in light-years?

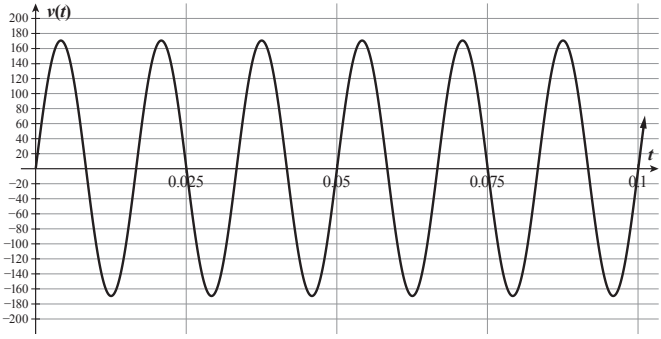
2. Since the year 2000, the number of regular subscribers to a certain magazine can best be described by the function $s(x) = 1200 \cdot 0.83^x$, where $s(x)$ is the number of subscribers x years after the year 2000. Is this function always increasing or always decreasing? What is the y-intercept of this function's graph, and what does it represent? If the number of magazine subscribers continues to follow this function, how many subscribers will there be in the year 2050?

3. Dianna has found that pants in the same labeled size made by different clothing brands have different sized waists, so she measures the waistband for each pair of pants she considers buying. Her ideal pants waistband measures 72 cm, but she still likes the fit of waistbands within 2.5 cm of this measure. Write an inequality that can be solved for w, the waistband measures Dianna prefers for her pants. If everyone preferred pants waistbands within 2.5 cm of their individual ideal waistband measure, m, then what inequality relates w and m?

4. Brian's yard is a rectangle, 40 feet long and 20 feet wide. He plans to put a walkway of width w feet around the border, within his yard, based on the area, a, of the middle portion of the yard enclosed by this walkway. Write and graph a function for w, the width of the walkway, in feet, in terms of a, the area of the enclosed yard space, in square feet.

5. Shervin flew a helicopter in a flight that rose above and dipped below an altitude of 5000 feet according to the function $h(t) = -t^4 + 10t^3 - 29t^2 + 20t$, where t represents time in minutes (since he first reached 5000 feet) and $h(t)$ represents the distance in feet above an altitude of 5000 feet. At what time was Shervin's helicopter exactly at an altitude of 5000 feet?

6. The AC power outlet at Zawadi's home has a voltage $v(t)$ that follows the sine curve $v(t) = 120\sqrt{2} \cdot \sin(120\pi t)$, shown below, where t represents time in seconds.



(a) The frequency of alternating current is defined in hertz, which are cycles per second. What is the hertz measurement for Zawadi's power supply?

(b) The peak-to-peak value of an AC voltage is twice the amplitude of the voltage sine curve. What is the peak-to-peak voltage of Zawadi's power supply, to the nearest tenth of a volt?

7. When the quarterback of the school football team caught the football, he saw a wide receiver 12 yards away from him. He watched the receiver run away from him for 1 second then threw the football at a speed 3.5 times the speed of the receiver, who continued to run at a steady rate. The receiver caught the ball 28 yards away from the quarterback, who had remained stationary. Write a function that relates t, the time in seconds since the quarterback caught the football, to r, the wide receiver's speed, in yards per second, for both the receiver's run and the ball's path through the air. Graph both functions on the same coordinate grid. What do the r- and t-values of the point of intersection represent in this situation? At what speed did the football travel through the air?