8.4 EXERCISES

■ SKILLS AND CONCEPTS

In Exercises 1–7, answer all of the following questions for each function.

a. What is the period, the amplitude, the frequency, and the equation of the midline?

b. What are the maximum and minimum values of f?

c. Graph the function without using a calculator. Make sure to graph at least one complete period.

d. Where are the horizontal intercepts (if they exist) located?

e. Where is the vertical intercept located?

f. Describe the transformation of the function as related to the graph of $f(\theta) = \sin(\theta)$ or $f(\theta) = \cos(\theta)$, as appropriate.

1. $f(\theta) = 4\cos(\theta)$; θ is in degrees.
2. $f(\theta) = \cos(2\theta)$; θ is in radians.
3. $f(\theta) = \sin\left(\frac{1}{4}\theta\right)$; θ is in degrees.
4. $f(\theta) = \cos(\theta - 120^\circ)$; θ is in degrees.
5. $f(\theta) = 3\sin\left(\theta + \frac{\pi}{3}\right)$; θ is in radians.

38. Average Temperatures The function

$$H(m) = -18.20\cos\left(\frac{\pi}{6}(m - 1)\right) + 60.46$$

models the average temperatures in degrees Fahrenheit in Huntsville, Alabama, during month m of the year. Using the function $T(m)$ given in Exercise 37, graph H and T together using a calculator. Describe the similarities and differences between the two functions.

39. Average Temperatures The function

$$S(m) = 9.40\cos\left(\frac{\pi}{6}(m - 1)\right) + 57.8$$

models the average temperatures in degrees Fahrenheit in Sydney, Australia, during month m of the year. (*Source:* **Modeled from data at www.engr.udayton.edu**)

a. Graph H (from Exercise 38) and S together using a calculator.

b. Describe the similarities and differences between these two functions.

c. Why was a positive cosine function used to model S?

d. What accounts for the differences between the average temperatures in these locations?

e. What is the phase shift in S? Interpret this value.

f. Suppose we wanted to use a negative cosine function to model S instead. Fill in the blank to create a function that models the average temperatures in Sydney.

$$S(m) = -9.40\cos\left(\frac{\pi}{6}(\_\_\_\_)\right) + 57.8$$