



It's Getting Hot Out Here! (Part 2)



Karissa records the temperature, in °Fahrenheit, outside her house during a 24-hour period. She constructed the function $F(t) = 80 - 10 \cos\left(\frac{\pi t}{12}\right)$ for $0 \leq t \leq 24$ to model the temperature, $F(t)$, after t hours.

1. After how many hours does the temperature reach its maximum value? How do you know?

2. The air conditioner is set to run when the outside temperature is at or above 75°.

a. Use the graph to estimate the time, t , at which the air conditioner turns on.

b. How long is the air conditioner running? How do you know?

3. Now let's see if we can solve this problem algebraically.

a. Is 75° above or below the average temperature of the day? By how many degrees?

b. If $F(t) = 75^\circ$, what is the value of $10 \cos\left(\frac{\pi t}{12}\right)$?

c. What must the value of $\cos\left(\frac{\pi t}{12}\right)$ be?

d. For which value(s) of θ on the unit circle is $\cos \theta$ equal to the value you found in part c? How many solutions are there?

e. For each of the values of θ you found in 3d, what must t be so that $\frac{\pi t}{12} = \theta$?

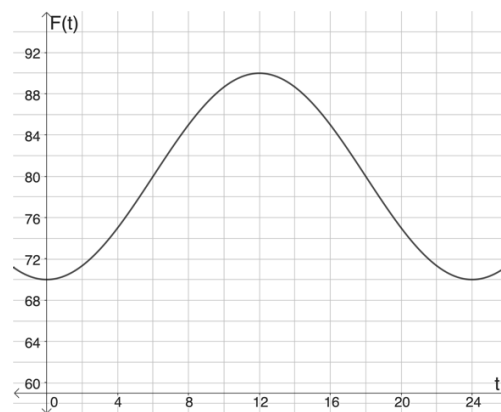
4. Use the graph to estimate at which times the temperature is 83°.

5. Write an equation that can be used to solve for the time(s), t , when the temperature is 83°.

6. If $F(t) = 83^\circ$, what is the value of $10 \cos\left(\frac{\pi t}{12}\right)$? What is the value of $\cos\left(\frac{\pi t}{12}\right)$?

7. For which values of θ is $\cos \theta$ equal to the value you found in question 5? Explain how you figured it out.

8. At which times, t , is the temperature outside Karissa's house 83°?



Lesson 7.3 – Trigonometric Equations and Inequalities

QuickNotes

Check Your Understanding

1. Solve $2 \cos \theta - 5 = -7$ for $0 \leq \theta \leq 2\pi$.
2. Find all solutions to $\sin \theta = 0.75$ for $0 \leq \theta \leq 2\pi$.
3. Find all x-intercepts of $f(x) = 4 \sin^2 x - 3$ on the interval $[0, 2\pi]$.
4. Patty decides to ride the Ferris wheel at the amusement park. Her distance above the ground (in feet) after t minutes is given by $y(t) = -20 \cos\left(\frac{\pi t}{4}\right) + 23$. Every ride is three full revolutions of the wheel.
 - a. How many minutes does one ride last?
 - b. Find all times t at which Patty is exactly 40 feet above the ground.