

Accelerated Math 3

Applying Trig Functions and Rational Functions Review

- 1. Extraterrestrial Being Problem.** Researchers find a creature from an alien planet. Its body temperature varies sinusoidally with time. Thirty-five minutes after they start timing, the body temperature reaches a high of 120°F . Twenty minutes after that it reaches its next low, 104°F .
 - (a) Sketch the graph of this sinusoid.
 - (b) Write a particular equation for body temperature as a function of minutes since the researchers started timing.
 - (c) What was the creature's body temperature when they first started timing?
 - (d) Find the first three times after they started timing at which the temperature was 114°F .

- 2. Tidal Wave Problem.** A tsunami is a high-speed deep ocean wave caused by an earthquake. It is popularly called a tidal wave because its effect is a rapid change in tide as the wave approaches land. The water first goes down from its normal level and then rises the same amount above its normal level. The period of a tsunami is about 15 minutes. Suppose that a tsunami of amplitude 10 m is approaching a place on Waikiki beach in Honolulu where the water is 9 meters deep.
 - (a) Assume that the depth of the water varies sinusoidally with time as the tsunami passes. Make a table showing the depth every 2 minutes as the tsunami passes.
 - (b) According to your mathematical model, what will be the minimum depth of the water? How do you explain the answer in terms of what will happen in the real world?
 - (c) Between what two times will there be no water at this particular point on the beach?
 - (d) The wavelength of a wave is the distance between two consecutive crests of the wave. If a tsunami is traveling 1200 km/h , what is its wavelength?
 - (e) If you were on a ship at sea, explain why you would not notice a tsunami passing by, even though the wave moves so fast?

3. **Biorhythm Problem.** According to biorhythm theory, your body is governed by three independent sinusoidal functions, each with a different period:
- Physical function: period = 23 days
 - Emotional function: period = 28 days
 - Intellectual function: period = 33 days
- (a) Phoebe is at a high point on all three cycles today! This means that she is at her very highest ability in all three functions. Assume that the amplitude of each sinusoid is 100 units and that the sinusoidal axis runs along the horizontal coordinate axis (also known as the x axis). Write a particular equation for each of the three functions.
- (b) Plot the graphs of all three functions on the same screen. Use a friendly window with an x range of about $[0, 100]$.
- (c) Phoebe will be at her next intellectual high 33 days from now. What will be the values of her emotional and physical functions on that day? Use the most time-efficient way to find these values, and indicate how you got the answers.
- (d) Biorhythm theory says that the most dangerous time for a particular function is when it crosses the sinusoidal axis. For each function, find the first positive time at which that function is most dangerous.
- (e) Just for fun, see if you can figure out how long it will be before all three of Phoebe's functions are again simultaneously at a high point.

Rational Expressions and Rational Functions Review

Name the vertical and horizontal asymptotes and all x and y intercepts of the following functions:

4. $f(x) = \frac{x+6}{x-6}$

5. $f(x) = \frac{2x^2 - 4x - 48}{x^3 - 16x}$

6. $h(x) = \frac{x^2 - 7x + 12}{x+3}$

Simplify the following expression (put your answer in simplest form):

7. $\frac{3x}{x^2 - 6x + 5} + \frac{15}{x^2 - 14x + 45}$