Quiz 4 – 6.1 - 6.6

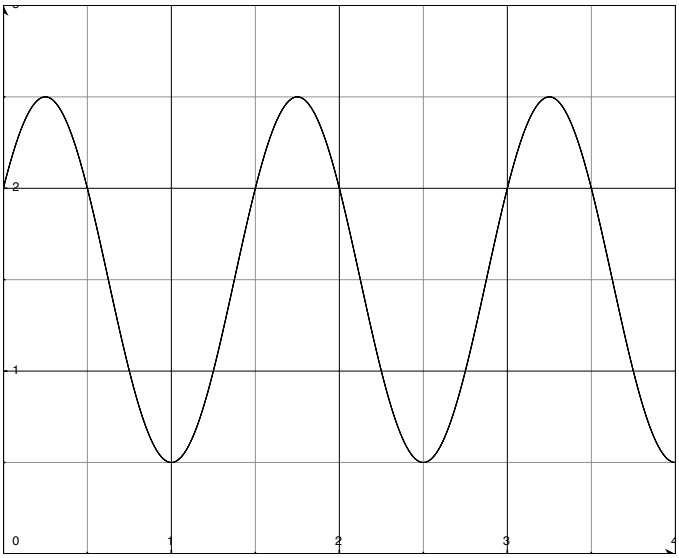
Solutions

November 8, 2006

Show all work for full credit. If you use a trial-and-error or guess-and-check method, or read a numerical solution from a graph on your calculator when an algebraic method is available, you will not receive full credit.

1. Suppose that $f(t)$ is a sinusoidal function of time (in seconds) which oscillates between a minimum value of 0.5 and a maximum value of 2.5. When $t = 1$, $f(t)$ is at its minimum value. Between time $t = 1$ and $t = 4$, $f(t)$ reaches its maximum value exactly twice. At $t = 4$, $f(t)$ is at its minimum value.

   (a) Draw the graph of $f(t)$ for $0 \leq t \leq 4$. [5]

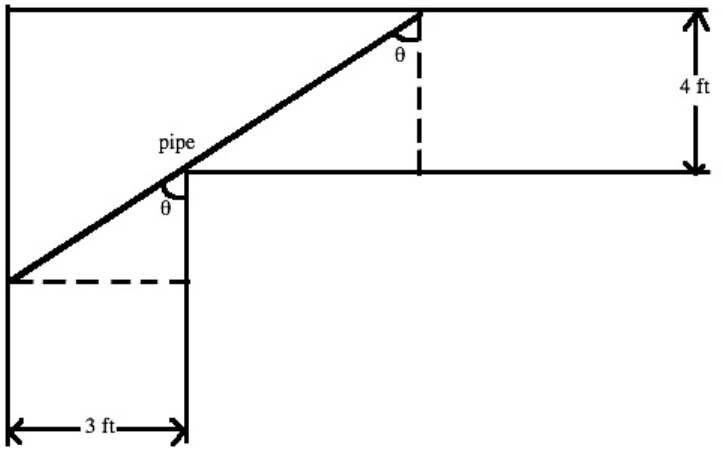


   (b) Find the equation for $f(t)$.

   The amplitude is 1, the midline is 1.5, the period is 1.5 and the horizontal shift will depend on whether you use a sine or cosine graph.

   $$f(t) = -\cos(\tfrac{4\pi}{3}(x + \tfrac{1}{2})) + 1.5 \text{ or } \cos(\tfrac{4\pi}{3}(x - \tfrac{1}{4})) + 1.5$$
   or $-\sin(\frac{4\pi}{3}(x - \frac{5}{8})) + 1.5$ or $\sin(\frac{4\pi}{3}(x + \frac{13}{8})) + 1.5$ [5]

2. Bruce is replumbing his house and needs to carry a copper pipe around the corner of a hallway. As he cheerfully walks down the hall and rounds the corner, the pipe becomes stuck, as pictured. Assume Bruce must always hold the pipe level; i.e. he can't tilt it up or down. Using trig functions, find a formula for the function $l(\theta)$ which computes the length of the longest pipe that will fit with the pictured angle θ. [Hint: Consider the length of the pipe as the sum of two pieces and then find the length of each piece.]

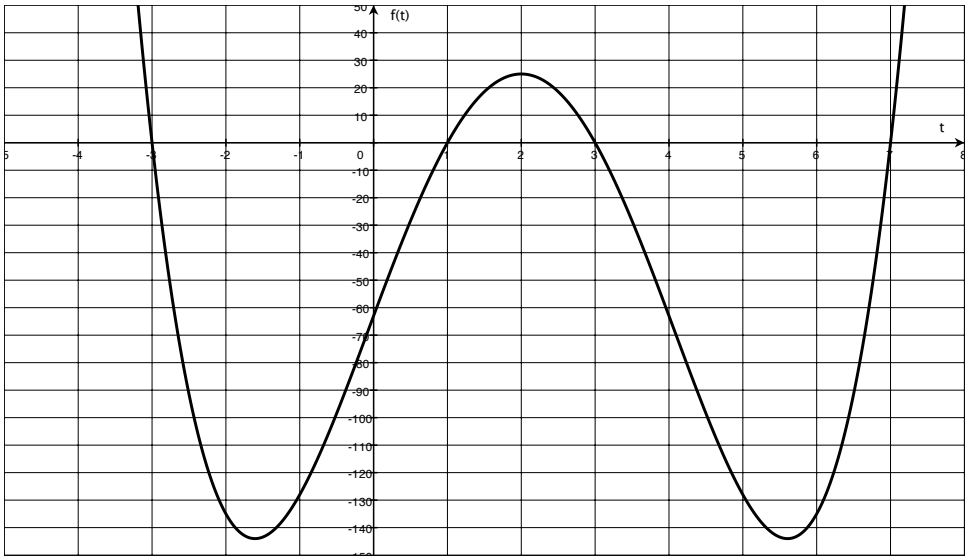


Notice that $\sin\theta = \frac{3}{l_1}$ and $\cos\theta = \frac{4}{l_2}$. Solve for l_1 and l_2 and then add them to get the entire length.

$$l(\theta) = \frac{3}{\sin\theta} + \frac{4}{\cos\theta} \quad [5]$$

The following questions are related to the Test 1 material. Your scores along with those on past and future quizzes will be used to determine if you have mastered the Test 1 material.

1. On approximately what intervals is the function below increasing? Decreasing?



Increasing: see test 1 solutions [2]

Decreasing: see test 1 solutions [2]

2. Suppose that the following table shows the cost of a taxi ride, in dollars, as a function of miles traveled.

m	0	1	2	3	4	5
$C(m)$	0	2.5	4.00	5.50	7.00	8.50

(a) What does $C(3.5)$ mean in practical terms? Estimate $C(3.5)$. [2]

see test 1 solutions

(b) If $C(m) = 3.5$, what does m mean in practical terms? Estimate m. [2]

see test 1 solutions