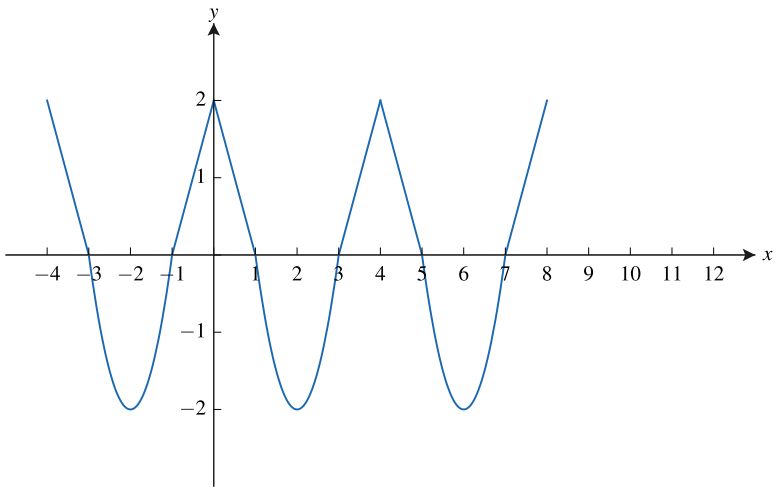
Thursday Night PreCalculus, January 11, 2024

Ride the Wave: Periodic Phenomena

Problems

1. The graph of a periodic function f is shown.



(a) What is the period, p, of the function?

(b) Sketch the next cycle of the given graph.

(c) Determine whether each function is periodic. If it is, state the period. If it is not, explain why.

(i) $y = f\left(\frac{1}{2}(x-1)\right)$

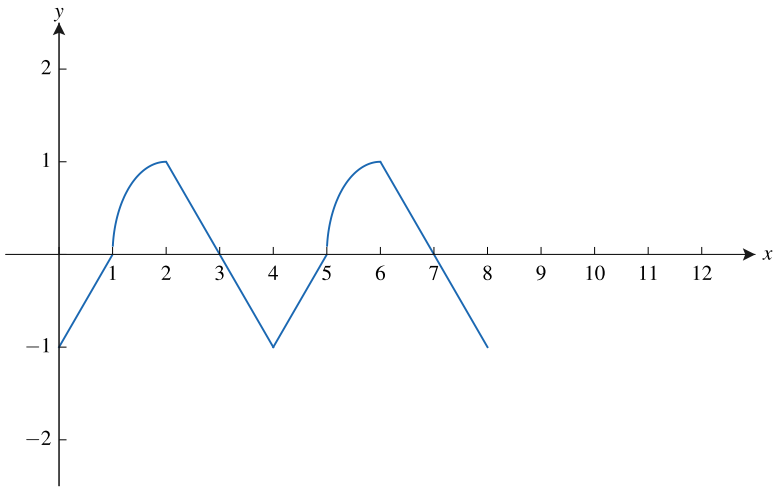
(ii) $y = -f(x)$

(iii) $y = f(-x)$

(iv) $y = f(2x)$

(v) $y = f(x^2)$

2. The graph of a periodic function f is shown below.



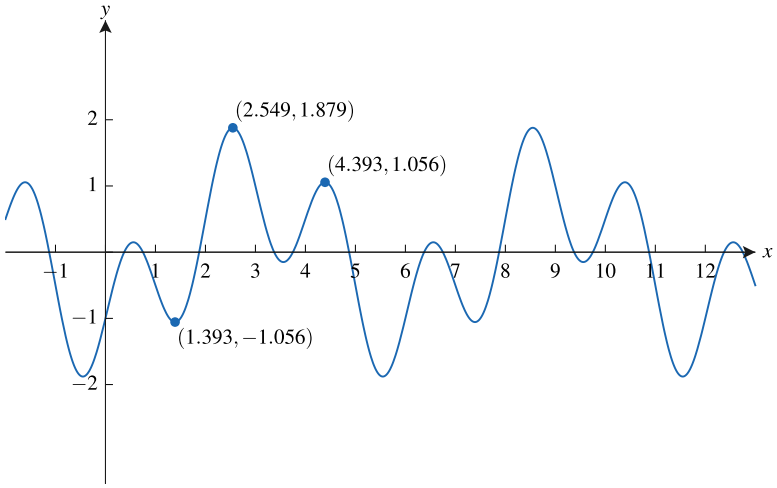
(a) Sketch another cycle of the function on the interval $[8, 12]$.

(b) Find $f(14)$ and $f(-1)$.

(c) Find the open intervals for $0 \leq x \leq 8$ on which the function is increasing and concave down.

(d) Find the open intervals for $0 \leq x \leq 8$ on which the function is decreasing and concave up.

3. The graph of a periodic function f is shown.



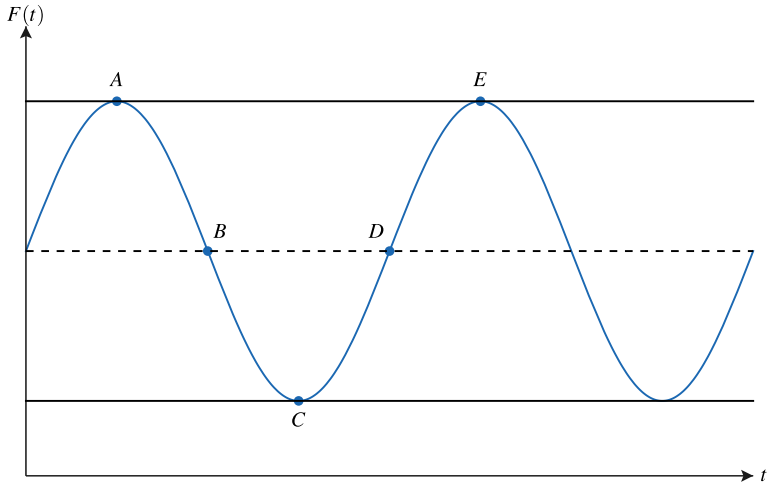
(a) Write an expression for a function g that is a horizontal translation of the graph of f which would be the exact same graph as that of f.

(b) Using the period of f, find the number of complete cycles of the graph of f in the xy-plane on the interval $0 \leq x \leq 350$.

4. The blades of a large industrial fan spin in a clockwise direction and rotate at a rate of 10 revolutions per second. Let the point P be the tip of the blade that is straight up at time $t = 0$. Point A is 75 inches from the floor. Each blade has length 14 inches from the center.

Let the periodic function F model the distance between point A and the floor, in inches, as a function of time t, in seconds.

(a) Use the given information to find possible coordinates $(t, F(t))$ of the points A, B, C, D, and E on the graph below.



(b) Use the graph of $y = F(t)$ and the points A, B, C, D, and E to find a time interval on which the graph of F is increasing and concave down.

(c) Find a time interval on which the graph of F is decreasing and concave down.