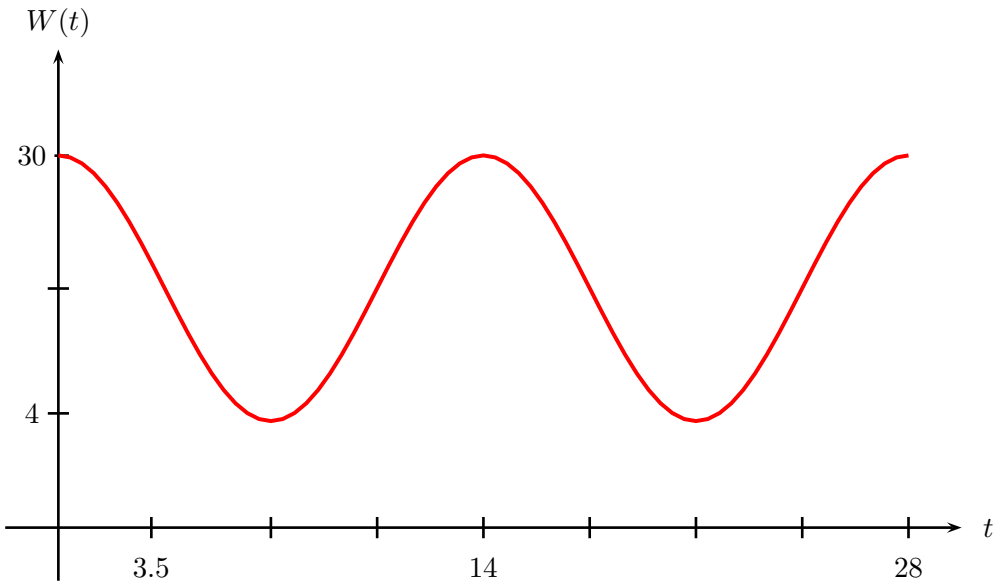
2. Before Hurricane Ike hit Galveston, TX, on September 10, 2008, there were reports of waves up to 26 ft. tall, with offshore buoys recording 14 seconds between waves. The water level along the seawall was already 4 feet above normal sea level, and the city of Galveston was concerned that the storm surge might overwhelm the seawall. Let $W(t)$ be the trigonometric function giving the height of the water above sea level at time t, where t is measured in seconds since one of the waves crashed against the seawall. Assume the minimum height is 4 feet and the waves surge from and return to that level.

   (a) (5 points) On the axes below, sketch two periods of $W(t)$. Be sure to include important axes markings and labels.



   (b) (7 points) Find a formula for $W(t)$.

   We can start by finding the midline (the average of the high and low of the wave), which is $(30+4)/2 = 17$. Next, the amplitude is 30 minus the midline, which is 13. Now, since the period is $T = 14$ seconds, the coefficient of t is $\frac{2\pi}{T} = \frac{\pi}{7}$. Lastly, since the wave starts at its high of 30 ft., this can most easily be modeled by a cosine graph. Thus, our final equation is $W(t) = 13\cos\left(\frac{\pi}{7}t\right) + 17$.

   (c) (3 points) For what t value, $0 \le t \le 14$, is the wave height decreasing the fastest?

   The wave height is decreasing the fastest when it crosses its midline downwards. This happens only once in the given interval, at $t = 3.5$.