Solutions to Practice Question 3: Modeling a Periodic Context

Note: Figure not drawn to scale.

3. To strengthen his muscles, Drew performs dumbbell curls, where he raises and lowers a dumbbell by bending at his elbow. When his arm is extended at his side, the middle of the dumbbell is 33 inches from the ground. The length from Drew's elbow to his palm where he is gripping the middle of the dumbbell is 11 inches. Drew begins with his right hand extended at his side, then completes one full curl in 4 seconds. A full curl consists of raising and lowering the dumbbell. He continues performing curls in this pattern for a minute.

The sinusoidal function h models the distance between the middle of the dumbbell in Drew's right hand and the ground, in inches, as a function of time t in seconds.

(A)	$G = (0,33)$ $H = (1, 44)$ $J = (2, 55)$ $K = (3,44)$ $L = (4, 33)$ Note: t-coordinates will vary. A correct set of coordinates for one full cycle of h as pictured is acceptable.		t-coordinates 1 pt $h(t)$ coordinates 1 pt
(B)	$a = -11, b = \dfrac{\pi}{2}, c = 0, d = 44$ Note: Based on horizontal shifts and reflections, there are other correct forms for $h(t)$.		Values of a and d 1 pt Values of b and c 1 pt
(C)	(i)	a. h is positive and increasing.	1 pt
	(ii)	Since h is concave down on the interval (t_1, t_2), h is increasing at a decreasing rate.	1 pt