

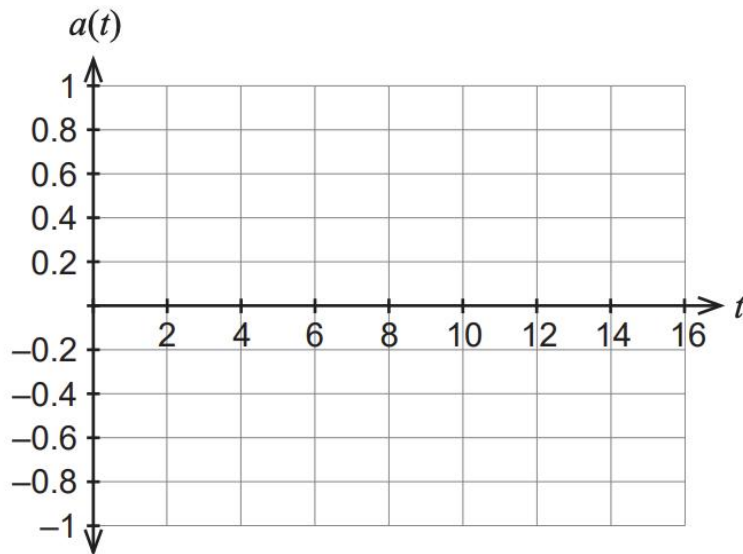
**Question 9****(8 marks)**

It takes an elevator 16 seconds to ascend from the ground floor of a building to the sixth floor. The velocity of the elevator during its ascent is given by

$$v(t) = \frac{9\pi}{16} \sin\left(\frac{\pi t}{16}\right) \text{ m/s.}$$

The velocity,  $v$ , is measured in metres per second, while the time,  $t$ , is measured in seconds.

- (a) Determine the acceleration of the elevator during its ascent and provide a sketch of the acceleration function for  $0 \leq t \leq 16$ . (2 marks)



- (b) With reference to your answer from part (a), explain what is happening to the velocity of the elevator in the interval  $0 < t < 8$  and in the interval  $8 < t < 16$ . (3 marks)

- (c) Suppose that the ground floor has displacement  $x = 0$  m. Determine the displacement function of the elevator and hence determine the height above the ground floor of the sixth floor. (3 marks)