Question 11 **(8 marks)**

Ava is flying a drone in a large open space at a constant height of 5 metres above the ground. She flies the drone due north so that it passes directly over her head and then, sometime later, reverses its direction and flies the drone due south so it passes directly over her again. With $t = 0$ defined as the moment when the drone first flies directly above Ava's head, the velocity of the drone, at time t seconds, is given by:

$$v = 2 \sin\left(\frac{t}{3} + \frac{\pi}{6}\right) \text{ m/s } 0 \leq t \leq 16$$

(a) Determine $x(t)$, the displacement of the drone at t seconds, where x (0) = 0. (3 marks)

(b) Where is the drone in relation to the pilot after 16 seconds? (2 marks)

(c) At a particular time, the drone is heading due south and it is decelerating at 0.5 m/s^2.
How far has the drone travelled from its initial position directly above Ava's head until this particular time? (3 marks)