9 **(a)** A particle P moves in a straight line such that its displacement, x m, from a fixed point O at time t s is given by $x = 10\sin 2t - 5$.

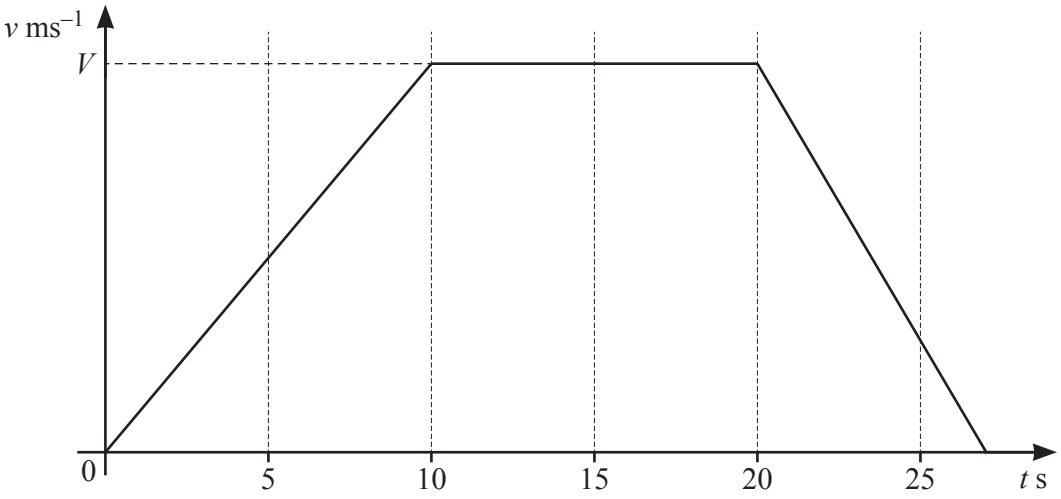
(i) Find the speed of P when $t = \pi$. [1]

(ii) Find the value of t for which P is first at rest. [2]

(iii) Find the acceleration of P when it is first at rest. [2]

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(b)



The diagram shows the velocity–time graph for a particle Q travelling in a straight line with velocity $v\,\text{ms}^{-1}$ at time $t\,\text{s}$. The particle accelerates at $3.5\,\text{ms}^{-2}$ for the first 10 s of its motion and then travels at constant velocity, $V\,\text{ms}^{-1}$, for 10 s. The particle then decelerates at a constant rate and comes to rest. The distance travelled during the interval $20 \leqslant t \leqslant 25$ is 112.5 m.

(i) Find the value of V. [1]

(ii) Find the velocity of Q when $t = 25$. [3]

(iii) Find the value of t when Q comes to rest. [3]

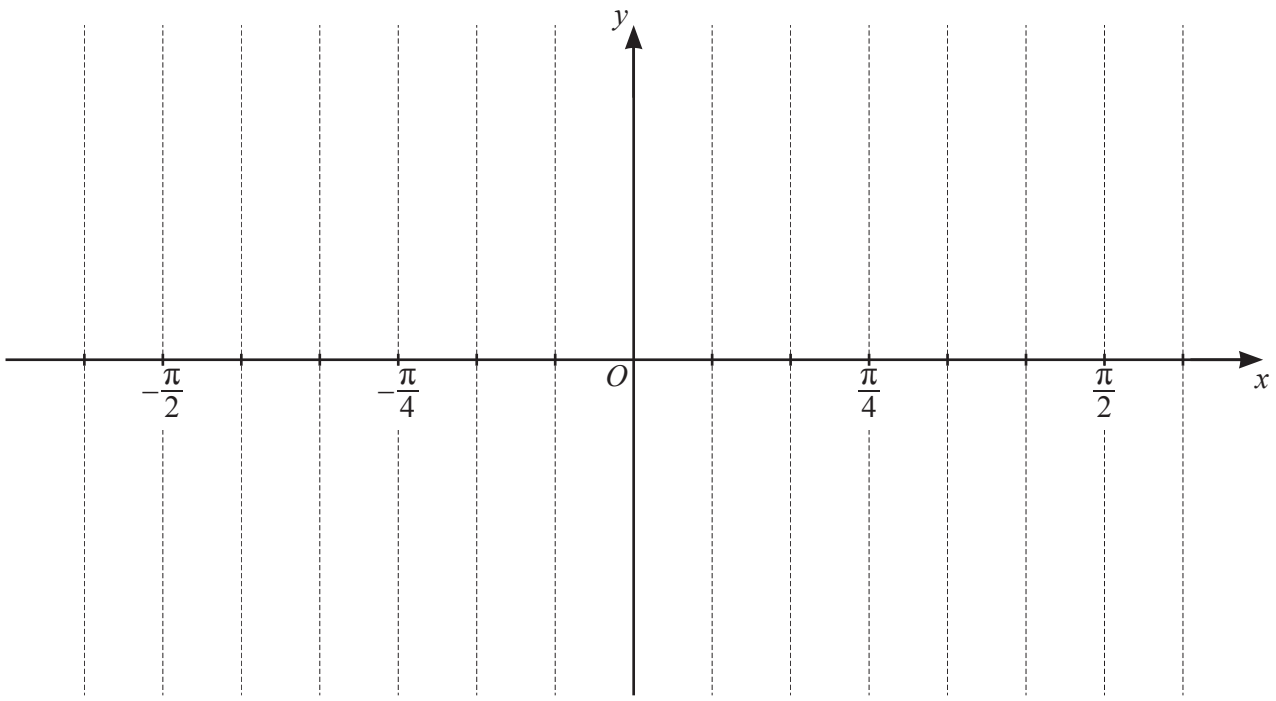
Question 10 is printed on the next page.

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[Turn over

10 **(a)** Solve $\tan 3x = -1$ for $-\frac{\pi}{2} \leqslant x \leqslant \frac{\pi}{2}$ radians, giving your answers in terms of π. [4]

(b) Use your answers to **part (a)** to sketch the graph of $y = 4\tan 3x + 4$ for $-\frac{\pi}{2} \leqslant x \leqslant \frac{\pi}{2}$ radians on the axes below. Show the coordinates of the points where the curve meets the axes.



[3]

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