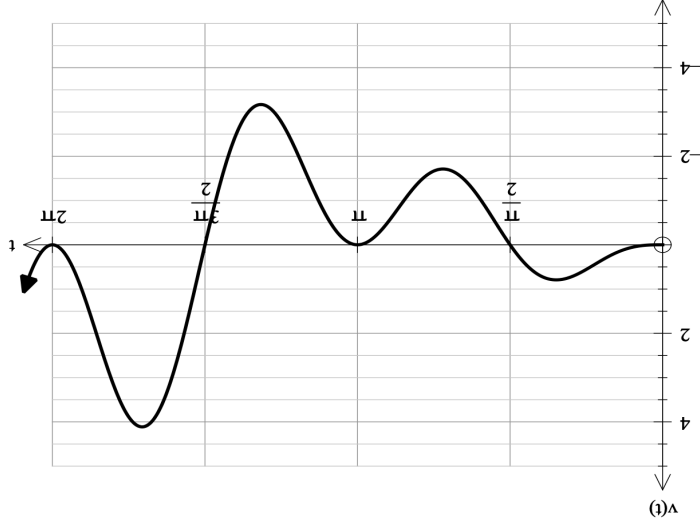


QUESTION 7

[4 marks - 1, 1, 2]

The graph of  $v(t) = 2x \sin^2 x \cos x$  as shown below displays the velocity of a body moving in rectilinear motion, in metres per second, for  $0 \leq t \leq 2\pi$  seconds.



a) Explain the significance of the value of  $\int_{\frac{3\pi}{2}}^0 v(t) dt$  in relation to the body's movement.

b) Explain the significance of the value of  $\int_{\frac{\pi}{2}}^{\pi} v(t) dt - \int_{\frac{\pi}{2}}^{\frac{\pi}{2}} v(t) dt$  in relation to the body's movement.

c) Calculate the total distance travelled between  $\pi$  seconds and  $2\pi$  seconds.

*End of Calculator Assumed Section*



QUESTION 4

[8 marks - 3, 2, 1, 2]

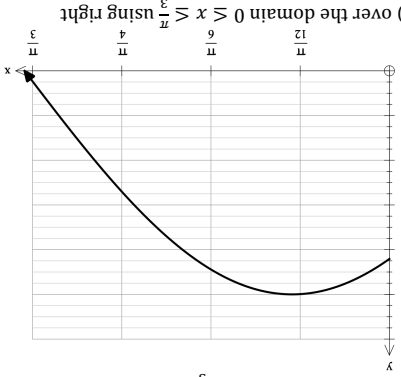
Calculator-Assumed

Formula sheet provided

Working time: 30 minutes

a) Estimate the area under the curve of  $y = \sin(2x + 1)$  over the domain  $0 \leq x \leq \frac{3}{\pi}$  using left rectangular strips of width  $\frac{\pi}{12}$ .

b) Estimate the area under the curve of  $y = \sin(2x + 1)$  over the domain  $0 \leq x \leq \frac{3}{\pi}$  using right rectangular strips of width  $\frac{\pi}{12}$ .



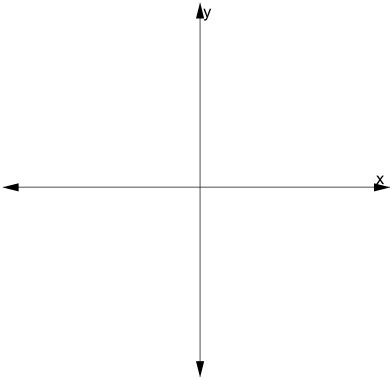
d) Evaluate the actual area under the curve. Suggest one way that you could modify the process you completed from parts a) to c) so that your estimation is closer to this result.

QUESTION 5

[5 marks – 2, 3]

Consider the cubic function  $y = -x^3 + 2x^2 + 8x$ .

- a) Determine the roots of the function and hence draw a sketch of the cubic on the axes provided, with its roots clearly labelled.  
*Note: you do not need to determine any other key features of the graph.*



- b) Show the use calculus to determine the exact area bound by the curve and the  $x$ -axis.

QUESTION 6

[6 marks – 2, 2, 2]

Show how you would use integrals to calculate the following shaded areas.  
*Note: You do not need to evaluate the areas.*

