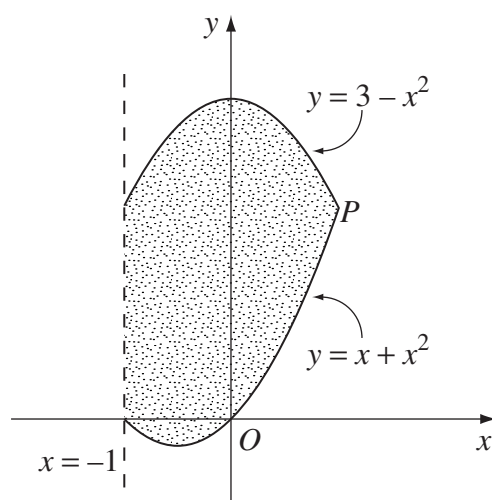


Question 4 (15 marks) Use a SEPARATE writing booklet.

(a)



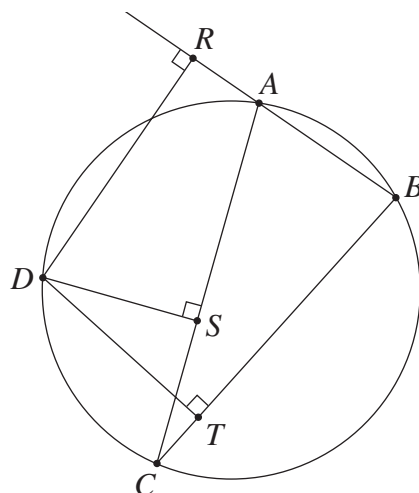
The shaded region bounded by $y = 3 - x^2$, $y = x + x^2$ and $x = -1$ is rotated about the line $x = -1$. The point P is the intersection of $y = 3 - x^2$ and $y = x + x^2$ in the first quadrant.

- | | |
|--|----------|
| (i) Find the x coordinate of P . | 1 |
| (ii) Use the method of cylindrical shells to express the volume of the resulting solid of revolution as an integral. | 3 |
| (iii) Evaluate the integral in part (ii). | 2 |

Question 4 continues on page 7

Question 4 (continued)

(b)



In the diagram, A , B , C and D are concyclic, and the points R , S , T are the feet of the perpendiculars from D to BA produced, AC and BC respectively.

- (i) Show that $\angle DSR = \angle DAR$. 2
- (ii) Show that $\angle DST = \pi - \angle DCT$. 2
- (iii) Deduce that the points R , S and T are collinear. 2
- (c) From a pack of nine cards numbered $1, 2, 3, \dots, 9$, three cards are drawn at random and laid on a table from left to right.
- (i) What is the probability that the number formed exceeds 400? 1
- (ii) What is the probability that the digits are drawn in descending order? 2

End of Question 4