3.

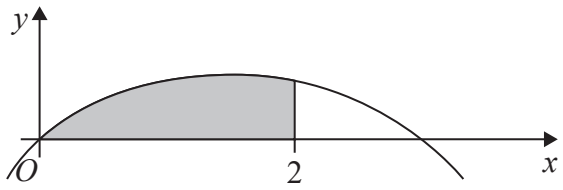


Figure 2

The shaded region in Figure 2 is bounded by the x-axis, the line with equation $x = 2$ and the curve with equation $y = \frac{1}{4}x(3-x)$.

This region is rotated through 2π radians about the x-axis, to form a solid of revolution which is used to model a uniform solid S.

The volume of S is $\frac{2}{5}\pi$

(a) Use the model and algebraic integration to show that the x coordinate of the centre of mass of S is $\frac{31}{24}$

(5)

The solid S is placed with its circular face on a rough plane which is inclined at $\alpha°$ to the horizontal. The plane is sufficiently rough to prevent S from sliding.

The solid S is on the point of toppling.

(b) Find the value of α

(3)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 3 continued

Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 3 continued

(Total for Question 3 is 8 marks)