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1. $f(x) = (2 - 5x)^{-2}, \quad |x| < \frac{2}{5}.$

Find the binomial expansion of $f(x)$, in ascending powers of x , as far as the term in x^3 , giving each coefficient as a simplified fraction.

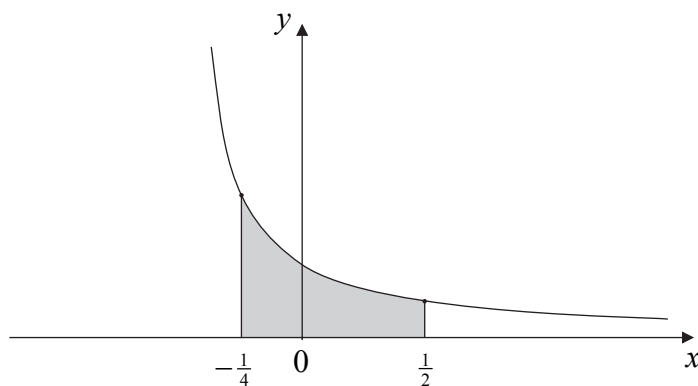
(5)

Handwriting lines for the answer.



2.

Figure 1



The curve with equation $y = \frac{1}{3(1+2x)}$, $x > -\frac{1}{2}$, is shown in Figure 1.

The region bounded by the lines $x = -\frac{1}{4}$, $x = \frac{1}{2}$, the x -axis and the curve is shown shaded in Figure 1.

This region is rotated through 360 degrees about the x -axis.

(a) Use calculus to find the exact value of the volume of the solid generated.

(5)

Figure 2

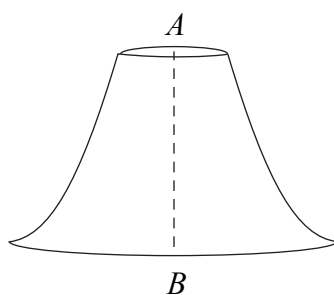


Figure 2 shows a paperweight with axis of symmetry AB where $AB = 3$ cm. A is a point on the top surface of the paperweight, and B is a point on the base of the paperweight. The paperweight is geometrically similar to the solid in part (a).

(b) Find the volume of this paperweight.

(2)



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Question 2 continued

Lined area for writing the answer to Question 2 continued.

(Total 7 marks)

Q2



N 2 3 5 6 2 A 0 5 2 0

Question 4 continued

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(Total 12 marks)

Q4

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7. The point A has position vector $\mathbf{a} = 2\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ and the point B has position vector $\mathbf{b} = \mathbf{i} + \mathbf{j} - 4\mathbf{k}$, relative to an origin O .

(a) Find the position vector of the point C , with position vector \mathbf{c} , given by

$$\mathbf{c} = \mathbf{a} + \mathbf{b}. \tag{1}$$

(b) Show that $OACB$ is a rectangle, and find its exact area. (6)

The diagonals of the rectangle, AB and OC , meet at the point D .

(c) Write down the position vector of the point D . (1)

(d) Find the size of the angle ADC . (6)



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Question 7 continued

Lined area for writing the answer to Question 7.

Q7

(Total 14 marks)

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8.

$$I = \int_0^5 e^{\sqrt{3x+1}} dx.$$

- (a) Given that $y = e^{\sqrt{3x+1}}$, complete the table with the values of y corresponding to $x = 2$, 3 and 4.

x	0	1	2	3	4	5
y	e^1	e^2				e^4

(2)

- (b) Use the trapezium rule, with all the values of y in the completed table, to obtain an estimate for the original integral I , giving your answer to 4 significant figures.

(3)

- (c) Use the substitution $t = \sqrt{3x+1}$ to show that I may be expressed as $\int_a^b kte' dt$, giving the values of a , b and k .

(5)

- (d) Use integration by parts to evaluate this integral, and hence find the value of I correct to 4 significant figures, showing all the steps in your working.

(5)



Question 8 continued

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Q8

(Total 15 marks)

TOTAL FOR PAPER: 75 MARKS

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