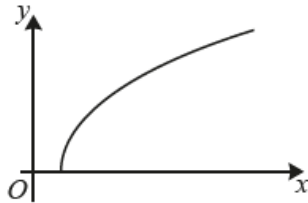


Mixed Exam Questions – Set 10

1.



The diagram shows part of the curve $y = \sqrt{x^2 - 1}$.

(a) Use the trapezium rule with 4 intervals to find an estimate for $\int_1^3 \sqrt{x^2 - 1} \, dx$.

Give your answer correct to 3 significant figures. [4]

(b) State whether the value from part (a) is an under-estimate or an over-estimate, giving a reason for your answer. [1]

(c) Explain how the trapezium rule could be used to obtain a more accurate estimate. [1]

2.

A curve has equation $2x^3 + 6xy - 3y^2 = 2$.

Show that there are no points on this curve where the tangent is parallel to $y = x$. [8]

3.

(a) Substance *A* is decaying exponentially such that its mass is *m* grams at time *t* minutes. Find the missing values of *m* and *t* in the following table.

<i>t</i>	0	10		50
<i>m</i>	1250	750	450	

[2]

(b) Substance *B* is also decaying exponentially, according to the model $m = 160e^{-0.055t}$, where *m* grams is its mass after *t* minutes.

(i) Determine the value of *t* for which the mass of substance *B* is half of its original mass. [3]

(ii) Determine the rate of decay of substance *B* when $t = 15$. [3]

(c) State whether substance *A* or substance *B* is decaying at a faster rate, giving a reason for your answer. [1]

4.

The points A and B have position vectors $3\mathbf{i} + 2\mathbf{j}$ and $4\mathbf{i} + 2\mathbf{j} - 5\mathbf{k}$ respectively.

(a) Find the length of AB . [2]

Point P has position vector $p\mathbf{i} - 3\mathbf{k}$, where p is a constant. P lies on the circumference of a circle of which AB is a diameter.

(b) Find the two possible values of p . [3]

5.

In this question you must show detailed reasoning.

A curve has equation $y = x^3 - 3x^2 + 4x$.

(a) Show that the curve has no stationary points. [2]

(b) Show that the curve has exactly one point of inflection. [2]
