

1 (a) Sketch the graph of $y = |x - 2|$.

[1]

(b) Solve the inequality $|x - 2| < 3x - 4$.

[3]

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- 3 (a) By sketching a suitable pair of graphs, show that the equation $\sec x = 2 - \frac{1}{2}x$ has exactly one root in the interval $0 \leq x < \frac{1}{2}\pi$. [2]

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- (b) Verify by calculation that this root lies between 0.8 and 1. [2]

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- (c) Use the iterative formula $x_{n+1} = \cos^{-1}\left(\frac{2}{4-x_n}\right)$ to determine the root correct to 2 decimal places. Give the result of each iteration to 4 decimal places. [3]

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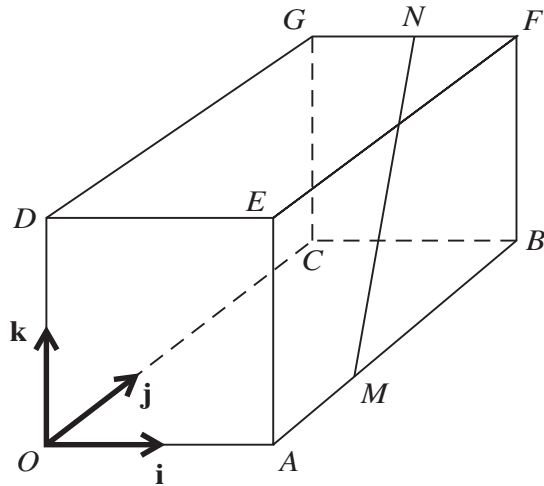
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(b) State what happens to the value of y as x tends to infinity. [1]

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In the diagram, $OABCDEFG$ is a cuboid in which $OA = 2$ units, $OC = 3$ units and $OD = 2$ units. Unit vectors \mathbf{i} , \mathbf{j} and \mathbf{k} are parallel to OA , OC and OD respectively. The point M on AB is such that $MB = 2AM$. The midpoint of FG is N .

- (a) Express the vectors \overrightarrow{OM} and \overrightarrow{MN} in terms of \mathbf{i} , \mathbf{j} and \mathbf{k} . [3]

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- (b) Find a vector equation for the line through M and N . [2]

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10 (a) The complex numbers v and w satisfy the equations

$$v + iw = 5 \quad \text{and} \quad (1 + 2i)v - w = 3i.$$

Solve the equations for v and w , giving your answers in the form $x + iy$, where x and y are real.

[6]

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- (b) (i) On an Argand diagram, sketch the locus of points representing complex numbers z satisfying $|z - 2 - 3i| = 1$. [2]

- (ii) Calculate the least value of $\arg z$ for points on this locus. [2]

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