

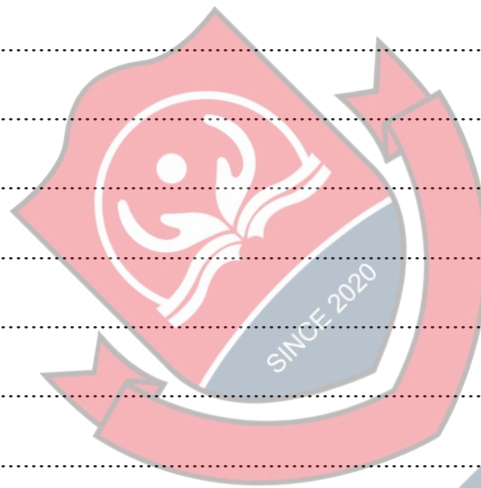
Cambridge International AS & A Level



- 1 The coefficient of x^2 in the expansion of $(1 - 4x)^6$ is 12 times the coefficient of x^2 in the expansion of $(2 + ax)^5$.

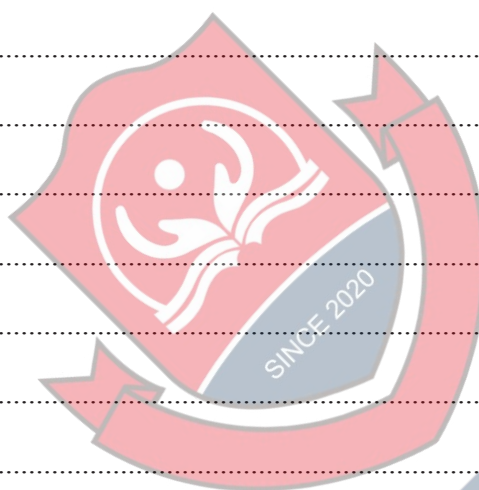
Find the value of the positive constant a .

[3]



- 2 The curve $y = x^2$ is transformed to the curve $y = 4(x-3)^2 - 8$.

Describe fully a sequence of transformations that have been combined, making clear the order in which the transformations have been applied. [5]



- 3 (a)** Show that the equation $\frac{7 \tan \theta}{\cos \theta} + 12 = 0$ can be expressed as

$$12 \sin^2 \theta - 7 \sin \theta - 12 = 0. \quad [3]$$

- (b)** Hence solve the equation $\frac{7 \tan \theta}{\cos \theta} + 12 = 0$ for $0^\circ \leq \theta \leq 360^\circ$. [3]

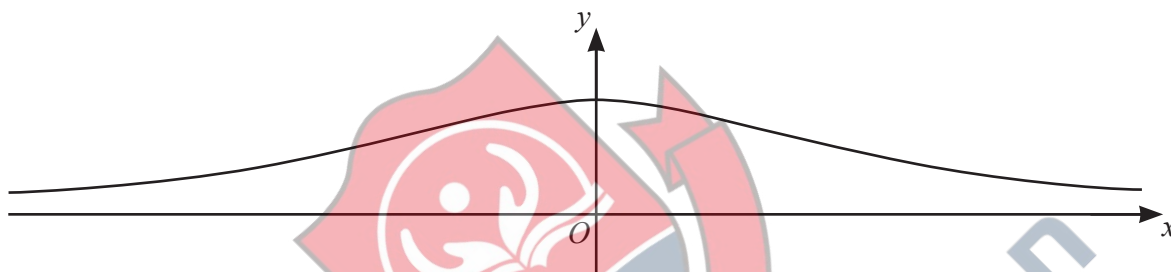
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4 The function f is defined as follows:

$$f(x) = \sqrt{x} - 1 \text{ for } x > 1.$$

(a) Find an expression for $f^{-1}(x)$.

[1]



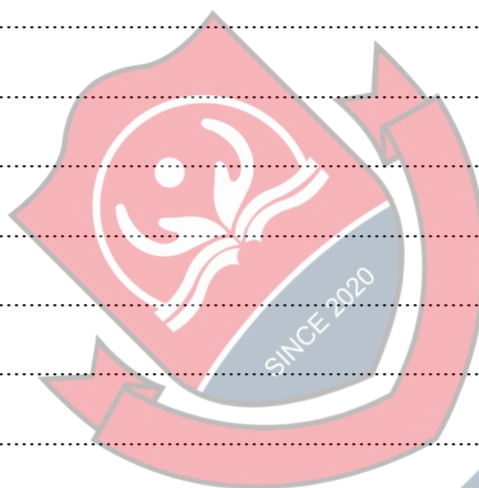
The diagram shows the graph of $y = g(x)$ where $g(x) = \frac{1}{x^2 + 2}$ for $x \in \mathbb{R}$.

(b) State the range of g and explain whether g^{-1} exists.

[2]

The function h is defined by $h(x) = \frac{1}{x^2 + 2}$ for $x \geq 0$.

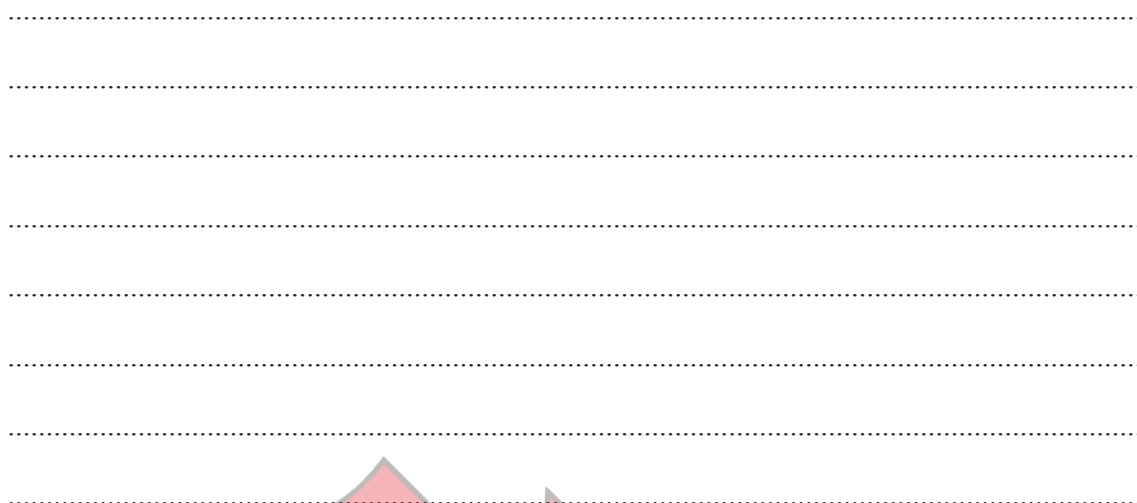
- (c) Solve the equation $hf(x) = f\left(\frac{25}{16}\right)$. Give your answer in the form $a + b\sqrt{c}$, where a , b and c are integers. [4]



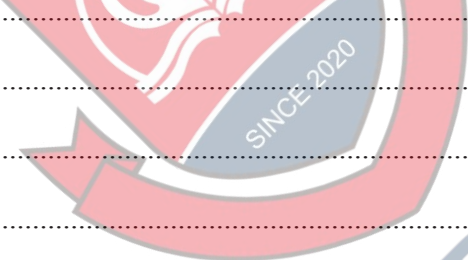
- (a) Given that $\theta = \frac{1}{4}\pi$, find the exact sum of the first 40 terms of the progression. [4]

The first and second terms of a geometric progression are $\tan \theta$ and $\sin \theta$ respectively, where $0 < \theta < \frac{1}{2}\pi$.

- (b) (i)** Find the sum to infinity of the progression in terms of θ . [2]

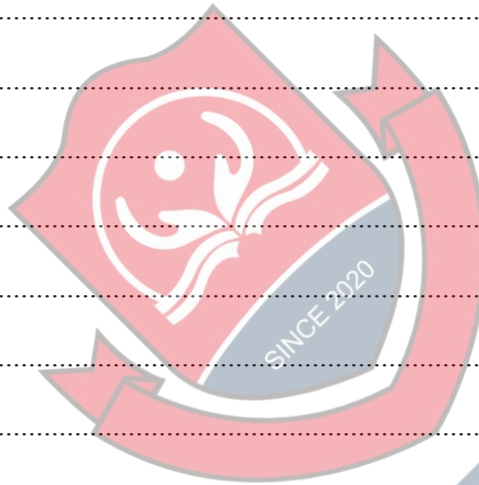


- (ii) Given that $\theta = \frac{1}{3}\pi$, find the sum of the first 10 terms of the progression. Give your answer correct to 3 significant figures. [3]



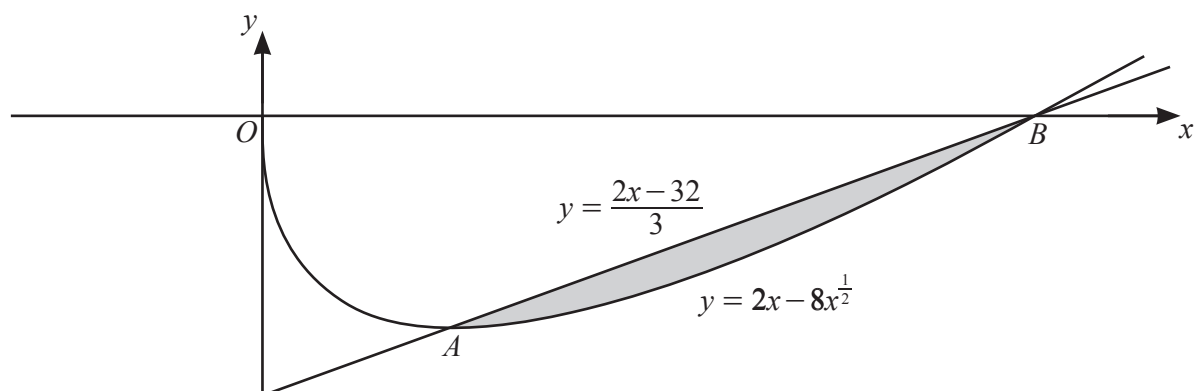
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- 6 The curve with equation $y = 2x - 8x^{\frac{1}{2}}$ has a minimum point at A and intersects the positive x -axis at B .
- (a) Find the coordinates of A and B . [4]



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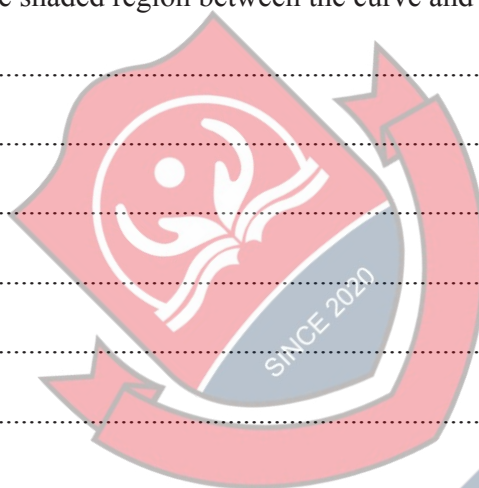
(b)



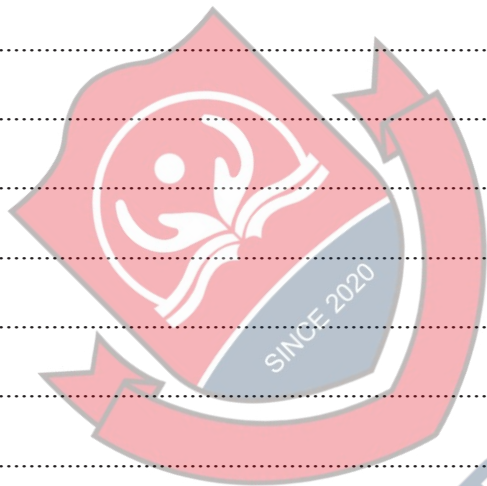
The diagram shows the curve with equation $y = 2x - 8x^{\frac{1}{2}}$ and the line AB . It is given that the equation of AB is $y = \frac{2x - 32}{3}$.

Find the area of the shaded region between the curve and the line.

[5]

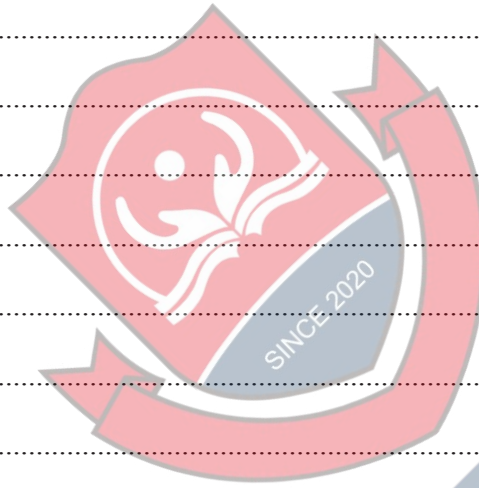


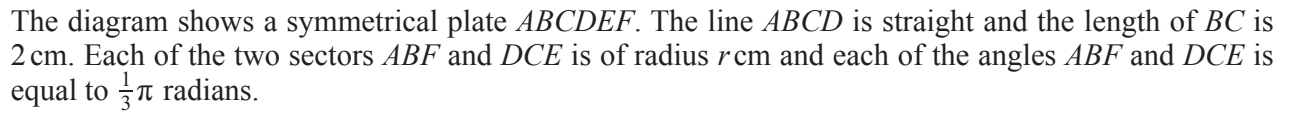
- 7 The equation of a circle is $(x-6)^2 + (y+a)^2 = 18$. The line with equation $y = 2a - x$ is a tangent to the circle.
- (a) Find the two possible values of the constant a . [5]



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- (b) For the greater value of a , find the equation of the diameter which is perpendicular to the given tangent. [3]



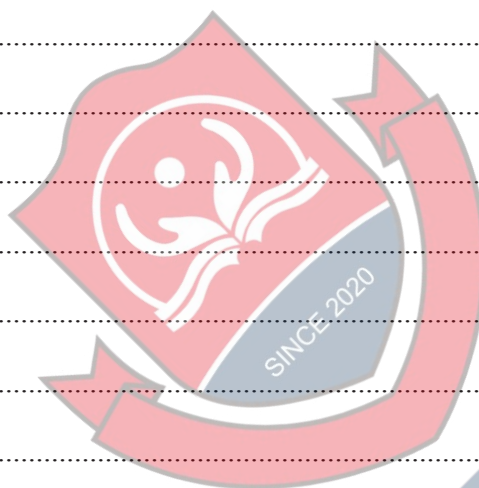


- (i) Show that the length $EF = 2.4$ cm. [2]

(ii) Find the area of the plate. Give your answer correct to 3 significant figures. [4]

- Find the value of r . Give your answer correct to 3 significant figures.

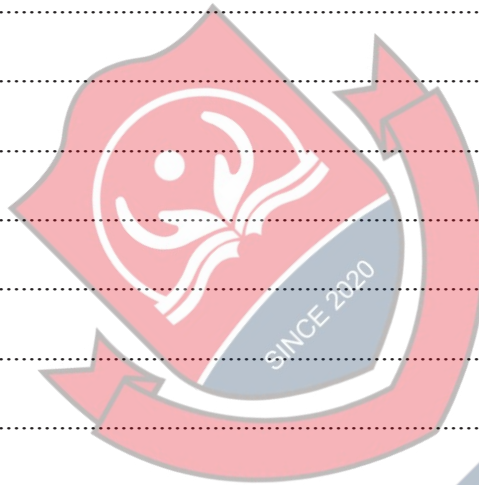
[4]



9 A function f is such that $f'(x) = 6(2x - 3)^2 - 6x$ for $x \in \mathbb{R}$.

(a) Determine the set of values of x for which $f(x)$ is decreasing.

[4]



(b) Given that $f(1) = -1$, find $f(x)$.

[4]



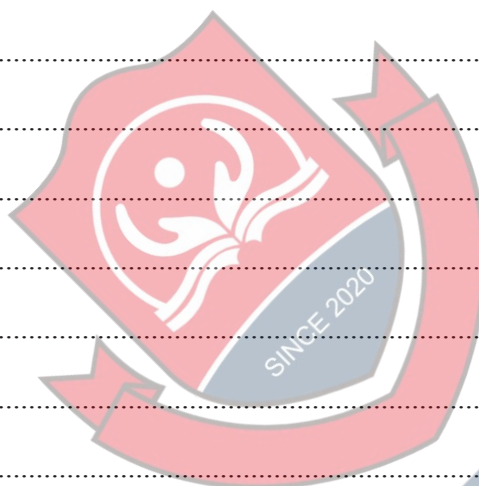
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- 10** The equation of a curve is $y = (5 - 2x)^{\frac{3}{2}} + 5$ for $x < \frac{5}{2}$.

- (a) A point P is moving along the curve in such a way that the y -coordinate of point P is decreasing at 5 units per second.

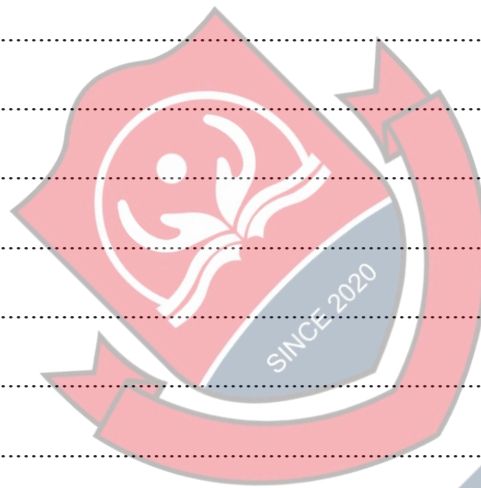
Find the rate at which the x -coordinate of point P is increasing when $y = 32$.

[4]



Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.



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