

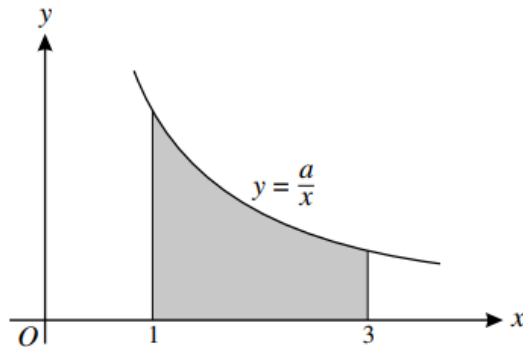
Integration 1

Q1.

A curve is such that $\frac{dy}{dx} = 3x^{\frac{1}{2}} - 6$ and the point (9, 2) lies on the curve.

- (i) Find the equation of the curve. [4]
- (ii) Find the x -coordinate of the stationary point on the curve and determine the nature of the stationary point. [3]
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Q2.



The diagram shows part of the curve $y = \frac{a}{x}$, where a is a positive constant. Given that the volume obtained when the shaded region is rotated through 360° about the x -axis is 24π , find the value of a . [4]

Q3.

Find $\int \left(x + \frac{1}{x}\right)^2 dx$. [3]

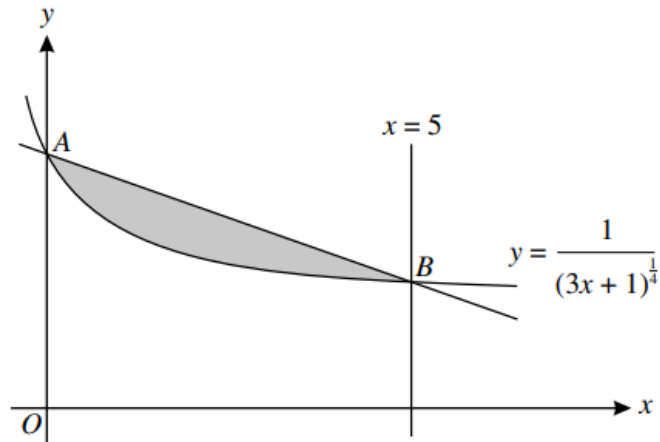
Q4.

The equation of a curve is $y = \frac{9}{2-x}$.

- (ii) Find the volume obtained when the region bounded by the curve, the coordinate axes and the line $x = 1$ is rotated through 360° about the x -axis. [4]
- (iii) Find the set of values of k for which the line $y = x + k$ intersects the curve at two distinct points. [4]
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Integration 1

Q5.



The diagram shows part of the curve $y = \frac{1}{(3x+1)^{\frac{1}{4}}}$. The curve cuts the y-axis at A and the line $x = 5$ at B.

(i) Show that the equation of the line AB is $y = -\frac{1}{10}x + 1$. [4]

(ii) Find the volume obtained when the shaded region is rotated through 360° about the x-axis. [9]

Q6.

A curve is such that $\frac{dy}{dx} = \frac{3}{(1+2x)^2}$ and the point $(1, \frac{1}{2})$ lies on the curve.

(i) Find the equation of the curve. [4]

(ii) Find the set of values of x for which the gradient of the curve is less than $\frac{1}{3}$. [3]

Q7.

Find $\int \left(x^3 + \frac{1}{x^3}\right) dx$. [3]

Q8.

(b) Find $\int (3x-2)^5 dx$ and hence find the value of $\int_0^1 (3x-2)^5 dx$. [4]

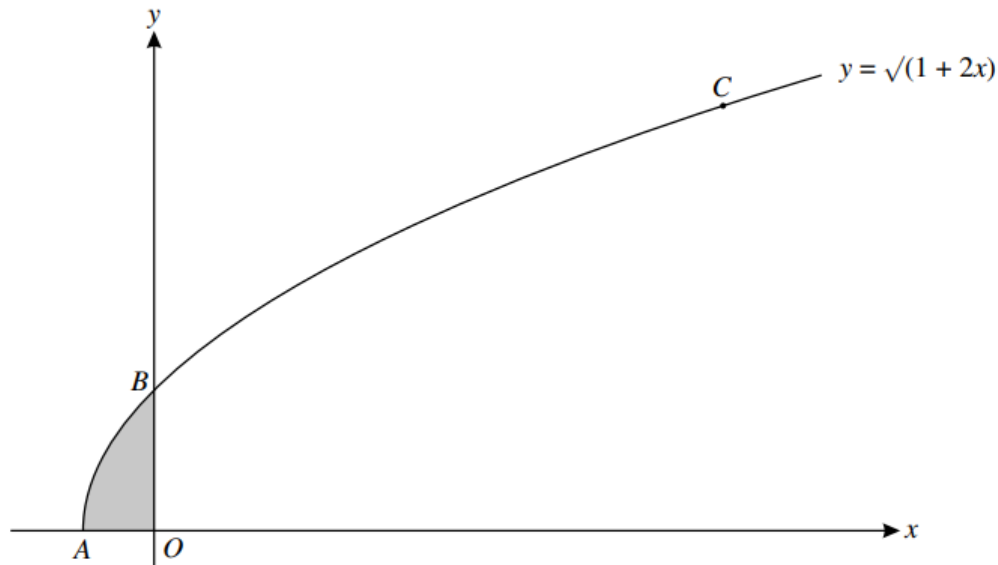
Integration 1

Q9.

A function f is defined for $x \in \mathbb{R}$ and is such that $f'(x) = 2x - 6$. The range of the function is given by $f(x) \geq -4$.

- (i) State the value of x for which $f(x)$ has a stationary value. [1]
- (ii) Find an expression for $f(x)$ in terms of x . [4]
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Q10.



The diagram shows the curve $y = \sqrt{1 + 2x}$ meeting the x -axis at A and the y -axis at B . The y -coordinate of the point C on the curve is 3.

- (i) Find the coordinates of B and C . [2]
- (ii) Find the equation of the normal to the curve at C . [4]
- (iii) Find the volume obtained when the shaded region is rotated through 360° about the y -axis. [5]
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Q11.

A curve is such that $\frac{dy}{dx} = 5 - \frac{8}{x^2}$. The line $3y + x = 17$ is the normal to the curve at the point P on the curve. Given that the x -coordinate of P is positive, find

- (i) the coordinates of P , [4]
- (ii) the equation of the curve. [4]
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