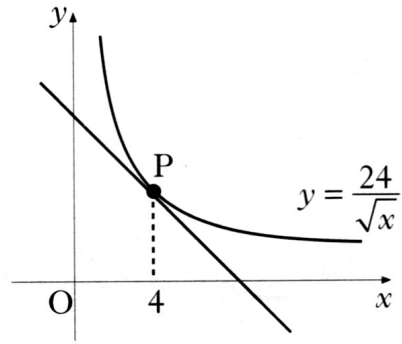


Banker Question: No. 3

The diagram shows the graph of $y = \frac{24}{\sqrt{x}}$, $x > 0$

Find the equation of the tangent at P,
where $x = 4$.

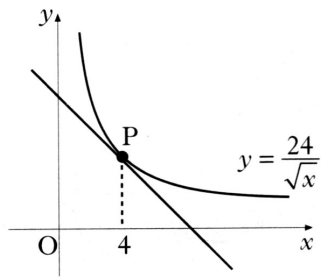


(6)

[Scroll to next page to see solution]

Banker Question: No. 3

Solution.



$$y = \frac{24}{\sqrt{x}}$$

Put into straight line form $y = 24x^{-\frac{1}{2}}$

Differentiate $\frac{dy}{dx} = -\frac{1}{2} \times 24x^{-\frac{3}{2}}$

Simplify $\frac{dy}{dx} = -12x^{-\frac{3}{2}}$

$$\Rightarrow \frac{dy}{dx} = -12 \times \frac{1}{(\sqrt{x})^3}$$

Find gradient when $x = 4$

$$\Rightarrow \frac{dy}{dx} = -12 \times \frac{1}{(\sqrt{4})^3}$$

$$\Rightarrow \frac{dy}{dx} = -12 \times \frac{1}{(2)^3}$$

$$\Rightarrow -\frac{12}{8} \Rightarrow -\frac{3}{2}$$

Find y-coordinate:

$$y = \frac{24}{\sqrt{x}} \Rightarrow y = \frac{24}{\sqrt{4}} \Rightarrow y = 12$$

gradient is: $-\frac{3}{2}$ point is (4, 12)

Equation is:

$$y - 12 = -\frac{3}{2}(x - 4) \Rightarrow 2y - 24 = -3x + 12$$

$$\Rightarrow 2y + 3x = 36$$

Notes on solution

By looking at the question you should know immediately it is about the differentiation and the equation of a tangent.

On further reading you should recognise the words: 'equation of tangent, 'at $x = 4$ ',

You **MUST** put the equation into straight line form before you can differentiate it.

e.g. $\sqrt{x} = x^{\frac{1}{2}}$ $\frac{1}{\sqrt{x}} = x^{-\frac{1}{2}}$ $\frac{1}{\sqrt{x^3}} = x^{-\frac{3}{2}}$

Differentiate to obtain the gradient of the tangent at any point on the curve

Rule: Bring the power down to the front. **DECREASE** the power by 1

If you are going to evaluate the derivative put it back into root form.

Evaluate the gradient function $\frac{dy}{dx}$ at the point $x = 4$ to find the gradient of the tangent where $x = 4$.

Use brackets to make sure you evaluate it properly.

To find the equation of a tangent – you need a point and the gradient.

You have the gradient ($\frac{dy}{dx}$ when $x = 4$)

You now need a point. So find the y-coordinate when $x = 4$.

Put $x = 4$ into the original equation.

Use the formula: $y - b = m(x - a)$ to find the equation of a line with gradient m through point (a, b)