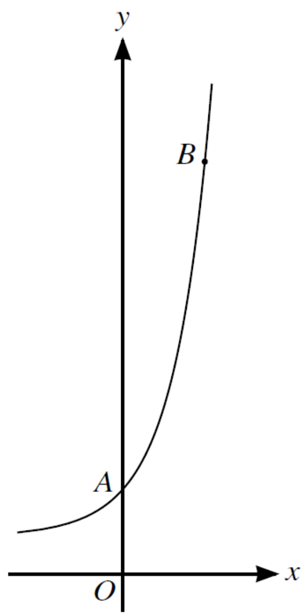
1. Nov/2023/Paper_9709/21/No.2

A curve has equation $y = 3\tan\frac{1}{2}x\cos 2x$.

Find the gradient of the curve at the point for which $x = \frac{1}{3}\pi$. [5]

2. Nov/2023/Paper_9709/22/No.6



The diagram shows the curve with parametric equations

$$x = 3\ln(2t - 3), \qquad y = 4t\ln t.$$

The curve crosses the y-axis at the point A. At the point B, the gradient of the curve is 12.

(a) Find the exact gradient of the curve at A. [5]

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(b) Show that the value of the parameter t at B satisfies the equation

$$t = \frac{9}{1 + \ln t} + \frac{3}{2}.$$ [2]

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(c) Use an iterative formula, based on the equation in **(b)**, to find the value of t at B, giving your answer correct to 3 significant figures. Use an initial value of 5 and give the result of each iteration to 5 significant figures. [3]

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3. Nov/2023/Paper_9709/31/No.1

Find the exact coordinates of the points on the curve $y = \dfrac{x^2}{1 - 3x}$ at which the gradient of the tangent is equal to 8. [5]

4. Nov/2023/Paper_9709/31/No.6

The parametric equations of a curve are

$$x = \sqrt{t} + 3, \qquad y = \ln t,$$

for $t > 0$.

(a) Obtain a simplified expression for $\dfrac{dy}{dx}$ in terms of t. [3]

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(b) Hence find the exact coordinates of the point on the curve at which the gradient of the normal is -2. [3]

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5. Nov/2023/Paper_9709/32/No.2

The parametric equations of a curve are

$$x = (\ln t)^2, \qquad y = e^{2-t^2},$$

for $t > 0$.

Find the gradient of the curve at the point where $t = e$, simplifying your answer. [4]

6. Nov/2023/Paper_9709/33/No.5

Find the exact coordinates of the stationary points of the curve $y = \frac{e^{3x^2-1}}{1-x^2}$. [6]

7. Nov/2023/Paper_9709/33/No.7

The equation of a curve is $x^3 + y^2 + 3x^2 + 3y = 4$.

(a) Show that $\dfrac{dy}{dx} = -\dfrac{3x^2 + 6x}{2y + 3}$. [3]

(b) Hence find the coordinates of the points on the curve at which the tangent is parallel to the x-axis. [5]