Differentiation Collated Past Papers - Parametric

2022 Question 1d.

(d) A curve is defined parametrically by the equations:

$$x = 2 + 3t \text{ and } y = 3t - \ln(3t - 1) \text{ where } t > \frac{1}{3}.$$

Find the coordinates, (x,y), of any point(s) on the curve where the tangent to the curve has a gradient of $\frac{1}{2}$.

You must use calculus and show any derivatives that you need to find when solving this problem.

2021 Question 1d.

(d) A curve is defined parametrically by the equations $x = t^2 + 3t$ and $y = t^2 \ln(2t - 3)$, for $t > \frac{3}{2}$.

Find the gradient of the tangent to the curve at the point $(10,0)$.

You must use calculus and show any derivatives that you need to find when solving this problem.

2020 Question 2e.

(e) A curve is defined by the parametric equations $x = \ln(t)$ and $y = 6t^3$ where $t > 0$.

The point P lies on the curve, and at point P, $\frac{d^2y}{dx^2} = 2$.

Find the exact coordinates of point P.

You must use calculus and show any derivatives that you need to find when solving this problem.

2019 Question 2c.

(c) A curve is defined parametrically by the equations $x = \frac{1}{(5-t)^2}$ and $y = 5t - t^2$.

Find the gradient of the tangent to the curve at the point when $t = 2$.

You must use calculus and show any derivatives that you need to find when solving this problem.

2019 Question 2e.

(e) If $y = e^u$ and $u = \sin 2x$ show that

$$\frac{d^2y}{dx^2} = \frac{d^2y}{du^2}\left(\frac{du}{dx}\right)^2 + \frac{dy}{du}\frac{d^2u}{dx^2}$$

You must use calculus and show any derivatives that you need to find when solving this problem.

2018 Question 1e.

(e) A curve is defined by the parametric equations $x = t^3 + 1$, $y = t^2 + 1$

Show that $\dfrac{\frac{d^2y}{dx^2}}{\left(\frac{dy}{dx}\right)^4}$ is a constant.

2018 Question 3b.

(b) A curve is defined parametrically by the parametric equations

$x = 5e^{2t}$

$y = 2e^{5t}$

Find the gradient of the tangent to this curve at the point where $t = 0$.

You must use calculus and show any derivatives that you need to find when solving this problem.

2017 Question 1d.

(d) A curve is defined parametrically by the equations $x = \sqrt{t+1}$ and $y = \sin 2t$.

Find the gradient of the tangent to the curve at the point when $t = 0$.

You must use calculus and show any derivatives that you need to find when solving this problem.

2016 Question 1c.

(c) A curve is defined by the parametric equations

$x = 2\cos 2t$ and $y = \tan^2 t$.

Find the gradient of the tangent to the curve at the point where $t = \frac{\pi}{4}$.

You must use calculus and show any derivatives that you need to find when solving this problem.

2015 Question 3c.

c) A curve is defined parametrically by the equations $x = 3\cos t$ and $y = \sin 3t$.

Find the gradient of the normal to the curve at the point where $t = \frac{\pi}{4}$.

You must use calculus and show any derivatives that you need to find when solving this problem.

2014 Question 1c.

(c) If $x = 2\sin t$ and $y = \cos 2t$ show that $\frac{\mathrm{d}y}{\mathrm{d}x} = -2\sin t$.

2013 Question 1d.

(d) A curve is defined by the parametric equations:

$$x = 5\sin t \quad \text{and} \quad y = 3\tan t$$

Find the gradient of the normal to the curve at the point where $t = \frac{\pi}{3}$.

Show any derivatives that you need to find when solving this problem.

2013 Question 3d.

(d) A curve is defined by the parametric equations:

$$x = t^2 - t \text{ and } y = t^3 - 3t$$

Find the coordinates of the point(s) on the curve for which the normal to the curve is parallel to the y-axis.

You must use calculus and clearly show your working, including any derivatives you need to find when solving this problem.