

The Quotient Rule

Just as we use the 'product rule' to differentiate a 'product', we use the 'quotient rule' to differentiate a 'quotient' (i.e. division).

The quotient rule:

$$\text{If } y = \frac{u}{v} \text{ then } \frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

1. If $y = \frac{x}{2x+5}$, find $\frac{dy}{dx}$

Memorisation Tips:

"Bottoms first!" The denominator (v) is the first term seen in the new denominator and numerator. The denominator gets squared. Note that in the numerator, we have – instead of the + seen in the Product Rule.

2. Find the stationary point of $y = \frac{\sin x}{e^{2x}}$, $0 < x < \pi$

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Differentiate with respect to x , giving your answer in its simplest form,

(b) $\frac{\sin 4x}{x^3}$.

(5)

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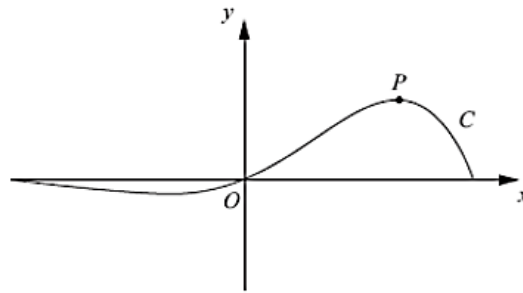


Figure 1

Figure 1 shows a sketch of the curve C which has equation

$$y = e^{x/3} \sin 3x, \quad -\frac{\pi}{3} \leq x \leq \frac{\pi}{3}.$$

(a) Find the x -coordinate of the turning point P on C , for which $x > 0$.

Give your answer as a multiple of π .

(6)

(b) Find an equation of the normal to C at the point where $x = 0$.

(3)