

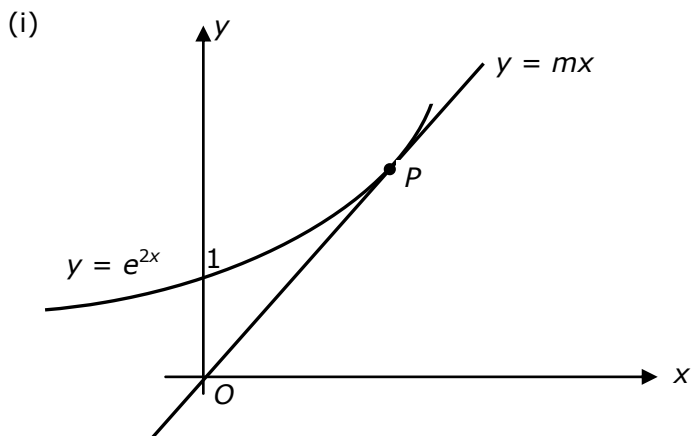


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2014 15c The line $y = mx$ is a tangent to the curve $y = e^{2x}$ at a point P .

- (i) Sketch the line and the curve on one diagram.
- (ii) Find the coordinates of P .
- (iii) Find the value of m .

1
3
1



Subs ② in ①: $2e^{2x}x = e^{2x}$

$$2e^{2x}x - e^{2x} = 0$$

$$e^{2x}(2x - 1) = 0$$

$$x = \frac{1}{2} \quad (\text{as } e^{2x} \neq 0)$$

Subs in $y = e^{2x}$:

$$y = e^{2(\frac{1}{2})}$$

$$= e$$

$$\therefore P\left(\frac{1}{2}, e\right)$$

(iii) Subs $P\left(\frac{1}{2}, e\right)$ in $y = mx$:

$$e = m\left(\frac{1}{2}\right)$$

$$m = 2e$$

State Mean:

0.71

1.20

0.30

(ii) For common point, equate y :

$$mx = e^{2x} \dots\dots\dots \textcircled{1}$$

For common gradient: equate y' :

$$m = 2e^{2x} \dots\dots\dots \textcircled{2}$$

* These solutions have been provided by [projectmaths](#) and are not supplied or endorsed by BOSTES.

Board of Studies: Notes from the Marking Centre

(i) This part was generally done very well. The majority of candidates correctly sketched an exponential graph and tangent.

Common problems were:

- not recognising that $y = mx$ passes through the origin;
- omitting the sketch of the tangent.

(ii) Candidates found this part quite challenging. The majority of candidates correctly equated $mx = e^{2x}$ and/or differentiated $y = e^{2x}$.

Common problems were:

- not interpreting the question correctly
- making algebraic errors when solving the equations
- leaving the answer in terms of m or a logarithmic expression.

(iii) This part was generally done well with most candidates substituting their co-ordinates for P into an appropriate equation.



A common problem was:

- not having a point P to use from c(ii)

http://www.boardofstudies.nsw.edu.au/hsc_exams/2014/pdf_doc/2014-maths.pdf