A-Level Pure Mathematics : Year 2

Differentiation III

13.1 Later Date Revision

Marks Available: 40

Table of Standard Derivatives

f(x)	f'(x)	In Formula Book?
x^n	$n x^{n-1}$	No
e^x	e^x	No
ln x	$\frac{1}{x}$	No
sin x	cos x	No
cos x	$-\sin x$	No
tan x	$sec^2 x$	Yes
csc x	$-\csc x \cot x$	Yes
sec x	sec x tan x	Yes
cot x	$-csc^2x$	Yes
arcsin x	$\frac{1}{\sqrt{1-x^2}}$	Yes
arccos x	$-\frac{1}{\sqrt{1-x^2}}$	Yes
arctan x	$\frac{1}{1+x^2}$	Yes

Question 1

Show that the derivative with respect to *x* of

$$y = sec x tan x$$

is

$$\frac{dy}{dx} = \sec x \left(2\sec^2 x - 1 \right)$$

Show that the derivative with respect to x of;

$$y = \csc x \cot x$$

is

$$\frac{dy}{dx} = \csc x \left(1 - 2 \csc^2 x \right)$$

[4 marks]

Question 3

Consider the function;

$$f(x) = \frac{8}{(1 - 3x)^3}$$

Show that;

$$f'(1) = \frac{9}{2}$$

A-Level Examination Question from January 2009, Paper C3 (Edexcel) Find the equation of the tangent to the curve

$$x = cos(2y + \pi)$$
 at $\left(0, \frac{\pi}{4}\right)$

Give your answer in the form y = ax + b, where a and b are constants to be found.

The curve

$$y = ln \left(x^2 - 3 \right)$$

crosses the x-axis at A and B.

(i) Find the coordinates of A and B

[3 marks]

(ii) The normals at *A* and *B* meet at *P*. Find the coordinates of *P*.

Show that the derivative of the inverse cotangent function

$$y = arccot x$$

is

$$\frac{dy}{dx} = -\frac{1}{1+x^2}$$

The following trigonometry identity will be useful;

$$\cot^2 y + 1 = \csc^2 y$$

The curve

$$y = \frac{2x+1}{2x-1}$$

crosses the x-axis at A and the y-axis at B.

Find the point of intersection of the tangents to the curve at A and B.

[8 marks]