Lesson 11

11.1 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
$\cot x$	$-\csc^2 x$	Yes
$\arcsin x$	$\dfrac{1}{\sqrt{1-x^2}}$	Yes
$\arccos x$	$-\dfrac{1}{\sqrt{1-x^2}}$	Yes
$\arctan x$	$\dfrac{1}{1+x^2}$	Yes

Question 1

Differentiate each of the following with respect to x,

(**i**) $y = 7x^4$

(**ii**) $y = 11\sqrt{x}$

[**2 marks**]

Question 2

By first expanding the brackets, differentiate each of the following with respect to x,

(**i**) $y = (x+6)(2x-5)$

(**ii**) $y = \sqrt{x}\left(\dfrac{1}{\sqrt{x}} + 3\sqrt{x}\right)$

[**4 marks**]

Question 3

Use The Chain Rule to differentiate each of the following with respect to x,

(i) $y = 4(x^3 + 3)^5$

(ii) $y = 4\cos(2x)$

(iii) $y = \sec^3 x$

(iv) $y = e^{\sin x} + e^{\cos x}$

[8 marks]

Question 4

(i)   Use The Product Rule to find $\dfrac{dy}{dx}$ if $y = x \ln x$

[2 marks]

(ii)   Find also $\dfrac{d^2 y}{dx^2}$

[1 mark]

Question 5

Consider the function

$$f(x) = \tan(3x)$$

Determine the value of

$$f'\left(\frac{\pi}{18}\right)$$

[4 marks]

Question 6

Use The Quotient Rule to show that if $y = \dfrac{x^3 - 1}{x^3 + 1}$

then $\dfrac{dy}{dx} = \dfrac{6x^2}{(x^3 + 1)^2}$

[4 marks]

Question 7

Find the equation of the tangent to the curve $y = \dfrac{11}{x^2 - 3}$ when $x = 5$

Give the answer in the form $ax + by + c = 0$

where a, b and c are integers to be found.

Question 8

The function $f(x)$ is given below

$$f(x) = \frac{x^2 \sin(2x)}{9\pi}$$

(i)   Find $f'(x)$

(ii)   Show that $f'\left(\dfrac{\pi}{4}\right) = \dfrac{1}{18}$

[5 marks]

Question 9

If

$$\frac{d}{dx}\left(\ln\sqrt{ax+b}\right) = \frac{4}{ax+1}$$

Find the values of a and b.

[4 marks]