Lesson 8

A-Level Pure Mathematics, Year 1
Additional Mathematics
The Algebra of Polynomials

8.1 Later Date Revision

The Factor Theorem
If for a given polynomial function $p(x)$, $p(a) = 0$ then $(x - a)$ is a factor of $p(x)$.

The Remainder Theorem
When $p(x)$ is divided by $(x - a)$ the remainder is $p(a)$

8.2 Exercise

Marks Available : 47

Question 1

A-Level Examination question from June 2005, Paper C2, Q3 (Edexcel)

(a) Use the factor theorem to show that $(x + 4)$ is a factor of $2x^3 + x^2 - 25x + 12$

[2 marks]

(b) Factorise $2x^3 + x^2 - 25x + 12$ completely.

[4 marks]

Question 2

A-Level Examination question from January 2006, Paper C2, Q1 (Edexcel)

$$f(x) = 2x^3 + x^2 - 5x + c$$

where c is a constant.

Given that $f(1) = 0$,

(a) Find the value of c

[2 marks]

(b) Factorise $f(x)$ completely

[4 marks]

(c) Find the remainder when $f(x)$ is divided by $(2x - 3)$

[2 marks]

Question 3

A-Level Examination question from June 2010, Paper C2, Q2 (Edexcel)

$$f(x) = 3x^3 - 5x^2 - 58x + 40$$

(a) Find the remainder when $f(x)$ is divided by $(x - 3)$

[2 marks]

Given that $(x - 5)$ is a factor of $f(x)$

(b) Find all the solutions of $f(x) = 0$.

[5 marks]

Question 4

A-Level Examination question from June 2009, Paper C2, Q3 (Edexcel)

$$f(x) = (3x - 2)(x - k) - 8$$

where k is a constant.

(a) Write down the value of $f(k)$

[1 mark]

When $f(x)$ is divided by $(x - 2)$ the remainder is 4

(b) Find the value of k

[2 marks]

(c) Factorise $f(x)$ completely

[3 marks]

Question 5

A-Level Examination question from January 2010, Paper C2, Q3 (Edexcel)

$$f(x) = 2x^3 + ax^2 + bx - 6$$

where a and b are constants.

When $f(x)$ is divided by $(2x - 1)$ the remainder is -5
When $f(x)$ is divided by $(x + 2)$ there is no remainder.

(a) Find the value of a and the value of b

[6 marks]

(b) Factorise $f(x)$ completely.

[3 marks]

Question 6

A-Level Examination question from January 2009, Paper C2, Q6 (Edexcel)

$$f(x) = x^4 + 5x^3 + ax + b$$

where a and b are constants.

The remainder when $f(x)$ is divided by $(x - 2)$ is equal to the remainder when $f(x)$ is divided by $(x + 1)$

(a) Find the value of a

[5 marks]

Given that $(x + 3)$ is a factor of $f(x)$

(b) find the value of b

[3 marks]