

## 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 ]

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