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PURE MATHEMATICS 2/P2

TOPIC- Algebra & functions

Sub-topic: Division (Factor & remainder theorem)

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1. $f(x) = 6x^3 + 3x^2 + Ax + B$, where A and B are constants.

Given that when $f(x)$ is divided by $(x + 1)$ the remainder is 45,

(a) show that $B - A = 48$

(2)

Given also that $(2x + 1)$ is a factor of $f(x)$,

(b) find the value of A and the value of B.

(4)

(c) Factorise $f(x)$ fully.
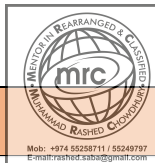
(3)

2. $$f(x) = 2x^3 - 7x^2 + 4x + 4$$

    (a) Use the factor theorem to show that $(x - 2)$ is a factor of $f(x)$.

(2)

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

(4)

3.
$$f(x) = 2x^3 - 5x^2 + ax + 18$$

where a is a constant.

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

(a) show that $a = -9$

(2)

(b) factori   f(x) completely.

(4)

Given that

$$g(y) = 2(3^{3y}) - 5(3^{2y}) - 9(3^y) + 18$$

(c) find the values of y that satisfy g$(y) = 0$, giving your answers to 2 decimal places where appropriate.

(3)

4.
$$f(x) = 2x^3 - 7x^2 - 10x + 24$$

(a) Use the factor theorem to show that $(x + 2)$ is a factor of f(x).

(2)

(b) Factorise f(x) completely.

(4)

5.
$$f(x) = 2x^3 - 7x^2 - 5x + 4$$

(a) Find the remainder when $f(x)$ is divided by $(x-1)$.

(2)

(b) Use the factor theorem to show that $(x+1)$ is a factor of $f(x)$.

(2)

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

(4)

6
$$f(x) = 3x^3 - 5x^2 - 58x + 40$$

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

(2)

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

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

(5)

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

where k is a constant.

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

(1)

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

(b) Find the value of k.

(2)

(c) Factori $f(x)$ completely.

(3)

8.

$$f(x) = 2x^3 - 3x^2 - 39x + 20$$

(a) Use the factor theorem to show that $(x + 4)$ is a factor of $f(x)$.

(2)

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

(4)

9.

$$f(x) = 3x^3 - 5x^2 - 16x + 12.$$

(a) Find the remainder when f(x) is divided by ($x - 2$).

(2)

Given that ($x + 2$) is a factor of f(x),

(b) factorise f(x) completely.

(4)

10.

$$f(x) = 2x^3 + 3x^2 - 29x - 60.$$

(a) Find the remainder when f(x) is divided by ($x + 2$).

(2)

(b) Use the factor theorem to show that ($x + 3$) is a factor of f(x).

(2)

(c) Factorise f(x) completely.

(4)

11.

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

(2)

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

(4)

12.

$f(x) = ax^3 + bx^2 - 4x - 3$, where a and b are constants.

Given that $(x - 1)$ is a factor of f(x),

(a) show that

$$a + b = 7$$

(2)

Given also that, when f(x) is divided by $(x + 2)$, the remainder is 9,

(b) find the value of a and the value of b, showing each step in your working.

(4)

13.

$$f(x) = x^3 + ax^2 + bx + 3, \quad \text{where } a \text{ and } b \text{ are constants.}$$

Given that when $f(x)$ is divided by $(x+2)$ the remainder is 7,

(a) show that $2a - b = 6$

(2)

Given also that when $f(x)$ is divided by $(x-1)$ the remainder is 4,

(b) find the value of a and the value of b.

(4)

14.

$$f(x) = x^4 + x^3 + 2x^2 + ax + b$$

where a and b are constants.

When f(x) is divided by $(x - 1)$, the remainder is 7.

(a) Show that $a + b = 3$.

(2)

When f(x) is divided by $(x + 2)$, the remainder is -8.

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

(5)

15.

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

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)

(b) Factori   f(x) completely.

(3)

16.

$$\mathrm{f}(x) = x^4 + 5x^3 + ax + b,$$

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)

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

(b) find the value of b.

(3)

17.

(a) Find the remainder when

$$x^3 - 2x^2 - 4x + 8$$

is divided by

(i) $x - 3$,

(ii) $x + 2$.

(3)

(b) Hence, or otherwise, find all the solutions to the equation

$$x^3 - 2x^2 - 4x + 8 = 0.$$

(4)

18.

$$f(x) = x^3 + 4x^2 + x - 6.$$

(a) Use the factor theorem to show that $(x + 2)$ is a factor of f(x).

(2)

(b) Factorise f(x) completely.

(4)

(c) Write down all the solutions to the equation

$$x^3 + 4x^2 + x - 6 = 0.$$

(1)

19.

$$f(x) = 2x^3 + x^2 - 5x + c, \text{ where } c \text{ is a constant.}$$

Given that $f(1) = 0$,

(a) find the value of c,

(2)

(b) factori e $f(x)$ completely,

(4)

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

(2)

20.

$$f(x) = 6x^3 + 13x^2 - 4$$

(a) Use the remainder theorem to find the remainder when $f(x)$ is divided by $(2x + 3)$.

(2)

(b) Use the factor theorem to show that $(x + 2)$ is a factor of $f(x)$.

(2)

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

(4)