



CAMI Mathematics: Grade 12

12.1 Functions

12.1 Cubic functions

1. Determine the remainder by using the remainder theorem.

(a) $f(r) = 8r^3 + 2r^2 + 6r + 5; g(r) = r - 6$

(b) $f(r) = -5r^3 + 8r^2 - 4r - 7; g(r) = r + 3$

(c) $f(c) = 3c^3 - 6c^2 + 3c - 4; g(c) = c + 6$

2. Determine the variable using the remainder theorem.

(a) If $f(c) = -3c^3 + uc^2 + 8c + 9$ is divided by $g(c) = c + 7$ the remainder is 1031.
Find the value of u .

(b) If $f(b) = 5b^3 + sb^2 - 4b - 6$ is divided by $g(b) = b + 6$ the remainder is -846.
Find the value of s .

(c) If $f(r) = 6r^3 + 2r^2 + hr + 1$ is divided by $g(r) = r - 4$ the remainder is 397.
Find the value of h .

3. Factor theorem

(a) Determine whether $h - 2$ is a factor of $f(h)$ if $f(h) = h^3 - 11h^2 + 38h - 38$

(b) Determine whether $r + 2$ is a factor of $f(r)$ if $f(r) = r^3 + 9r^2 + 20r + 12$

4. Determine the variable using the factor theorem.

(a) If $d + 2$ is a factor of $f(d) = d^3 + md^2 - 2d + 24$, determine the value of m .

(b) If $y - 3$ is a factor of $f(y) = y^3 + ny + 12$, determine the value of n .

5. Equations of cubic functions

(a) Determine the polynomial $t(w)$ if $t(-3) = 0$, $t(-1) = 0$ and $t(6) = 0$.

(b) Determine the polynomial $t(y)$ if $t(2) = 0$, $t(-1) = 0$ and $t(-5) = 0$.

6. Factorize and solve the following cubic functions.

(a) $x^3 - 3x^2 - 10x + 24 = 0$

(b) $x^3 - 9x^2 + 26x - 24 = 0$



CAMI Mathematics: Grade 12

MEMO

1. Determine the remainder by using the remainder theorem. [5.1.1.2]

(a) $f(r) = 8r^3 + 2r^2 + 6r + 5; g(r) = r - 6$

$$f(6) = 8(6)^3 + 2(6)^2 + 6(6) + 5$$

$$f(6) = 1841$$

(b) $f(r) = -5r^3 + 8r^2 - 4r - 7; g(r) = r + 3$

$$f(-3) = -5(-3)^3 + 8(-3)^2 - 4(-3) - 7$$

$$f(-3) = 212$$

(c) $f(c) = 3c^3 - 6c^2 + 3c - 4; g(c) = c + 6$

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

$$f(-6) = -886$$

2. Determine the variable using the remainder theorem. [5.1.1.3]

(a) $f(c) = -3c^3 + uc^2 + 8c + 9$

$$1031 = -3(-7)^3 + u(-7)^2 + 8(-7) + 9$$

$$1031 = 49u + 982$$

$$49u = 49$$

$$\therefore u = 1$$

(b) $f(b) = 5b^3 + sb^2 - 4b - 6$

$$-846 = 5(-6)^3 + s(-6)^2 - 4(-6) - 6$$

$$-846 = 36s - 1052$$

$$36s = 216$$

$$\therefore s = 6$$

(c) $f(r) = 6r^3 + 2r^2 + hr + 1$

$$397 = 6(4)^3 + 2(4)^2 + h(4) + 1$$

$$397 = 4h + 417$$

$$4h = -20$$

$$h = -5$$



3. Factor theorem [5.1.2.2]

(a) $f(h) = h^3 - 11h^2 + 38h - 38$
 $f(2) = (2)^3 - 11(2)^2 + 38(2) - 38$
 $f(2) = 2$
 $h - 2$ not a factor $f(2) \neq 0$

(b) $f(r) = r^3 + 9r^2 + 20r + 12$
 $f(-2) = (-2)^3 + 9(-2)^2 + 20(-2) + 12$
 $f(-2) = 0$
 $r + 2$ a factor because $f(-2) = 0$

4. Determine the variable using the factor theorem. [5.1.2.3]

(a) $f(d) = d^3 + md^2 - 2d + 24$,
 $f(-2) = (-2)^3 + m(-2)^2 - 2(-2) + 24$
 $0 = -8 + 4m + 4 + 24$
 $4m = -20$
 $m = -5$

(b) If $y - 3$ is a factor of $f(y) = y^3 + ny + 12$,
 $f(3) = (3)^3 + n(3) + 12$
 $0 = 27 + 3n + 12$
 $3n = -39$
 $n = -13$

5. Equations of cubic functions [5.1.2.4]

(a) $t(-3) = 0$, $t(-1) = 0$, $t(6) = 0$.
 $t(w) = (w + 3)(w + 1)(w - 6)$
 $t(w) = (w + 3)(w^2 - 5w - 6)$
 $t(w) = w^3 - 2w^2 - 21w - 18$

(b) $t(2) = 0$, $t(-1) = 0$, $t(-5) = 0$.
 $t(y) = (y - 2)(y + 1)(y + 5)$
 $t(y) = (y - 2)(y^2 + 6y + 5)$
 $t(y) = y^3 + 4y^2 - 7y - 10$



CAMI Mathematics: Grade 12

6. Factorize and solve the following cubic functions. [5.1.2.5]

(a) $x^3 - 3x^2 - 10x + 24 = 0$
 $f(2) = (2)^3 - 3(2)^2 - 10(2) + 24$
 $f(2) = 0$
 $x - 2$ a factor
 $f(x) = (x - 2)(x^2 - x - 12)$
 $f(x) = (x - 2)(x - 4)(x + 3)$
 $0 = (x - 2)(x - 4)(x + 3)$
 $x = 2$
 $x = 4$
 $x = -3$

(b) $x^3 - 9x^2 + 26x - 24 = 0$
 $f(2) = (2)^3 - 9(2)^2 + 26(2) - 24$
 $f(2) = 0$
 $x - 2$ a factor
 $f(x) = (x - 2)(x^2 - 7x + 12)$
 $f(x) = (x - 2)(x - 4)(x - 3)$
 $0 = (x - 2)(x - 4)(x - 3)$
 $x = 2$
 $x = 4$
 $x = 3$

