Polynomials: Remainder & Factor Theorem (Grade 12)

MEMORANDUM

Name: ..... Class: .....

Date: .....

MARK ____ / 22

Answer all questions. Show all your working — marks are awarded for method as well as the final answer. **Teacher copy: accept any correct equivalent method.**

1 Determine the remainder when $f(x) = x^3 - 4x^2 + x + 6$ is divided by $(x - 1)$. (2)

$f(1) = 1 - 4 + 1 + 6 = \mathbf{4}$ ✓✓ (2)

2 Show that $(x - 2)$ is a factor of $f(x) = x^3 - 4x^2 + x + 6$. (2)

$f(2) = 8 - 16 + 2 + 6 = 0$, so by the factor theorem $\mathbf{(x - 2)}$ **is a factor.** ✓✓ (2)

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

$\mathbf{(x - 2)(x - 3)(x + 1)}$ ✓✓✓ (3)

4 Solve for x: $x^3 - 4x^2 + x + 6 = 0$ (2)

$\mathbf{x = 2, x = 3}$ **or** $\mathbf{x = -1}$ ✓✓ (2)

5 Determine the remainder when $f(x) = 2x^3 + x - 3$ is divided by $(x + 1)$. (2)

$f(-1) = -2 - 1 - 3 = \mathbf{-6}$ ✓✓ (2)

6 If $(x - 3)$ is a factor of $f(x)$, what is $f(3)$? (1)

0 ✓ (1)

7 Which whole-number values should you test first when factorising a **monic** cubic with integer coefficients (just x^3 in front) and constant term 12? (2)

The factors of 12: **±1, ±2, ±3, ±4, ±6, ±12** ✓✓ (2)

8 Factorise $f(x) = 2x^3 + x^2 - 13x + 6$ completely. (4)

$f(2) = 16 + 4 - 26 + 6 = 0$, so $(x - 2)$ is a factor; $2x^3 + x^2 - 13x + 6 = (x - 2)(2x^2 + 5x - 3) = \mathbf{(x - 2)(2x - 1)(x + 3)}$ ✓✓✓✓ (4)

9 Solve for x: $x^3 - 7x + 6 = 0$ **(4)**

$f(1) = 0 \rightarrow (x-1)(x^2+x-6) = (x-1)(x+3)(x-2) \rightarrow$ **$x = 1$, 2 or -3** ✓✓✓✓ **(4)**

TOTAL: 22 marks

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