Polynomials and factor theorem: 10 practice questions

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Name: _____ Date: _____

Attempt all questions and show your working. Suggested time: 15 to 20 minutes.

Section A: Consolidating (Questions 1-4)

Question 1

For the polynomial $P(x) = 4x^3 - 2x^2 + x - 7$, state:

(a) the degree

(b) the leading coefficient

(c) the constant term

(d) the coefficient of x^2

Question 2

State whether each expression is a polynomial. Give a reason for each one that is not.

(a) $3x^2 - 5x + 1$

(b) $2/x + 1$

(c) $\sqrt{x} + 4$

(d) $x^4 - \frac{1}{2}x$

Question 3

For $P(x) = x^3 - 3x + 2$, find:

(a) $P(0)$

(b) $P(2)$

(c) $P(-1)$

Question 4

Expand and simplify $(x + 2)(x^2 - 3x + 1)$.

Section B: Standard (Questions 5-10)

Question 5

Let $P(x) = 2x^3 + x^2 - 5x + 4$ and $Q(x) = x^3 - 3x^2 + 2$.

(a) Find $P(x) + Q(x)$.

(b) Find $P(x) - Q(x)$.

(c) Without expanding, state the degree of $P(x) \times Q(x)$.

Question 6

Use long division to find the quotient and the remainder for each division.

(a) $(x^3 + 2x^2 - 5x - 6) \div (x - 2)$

(b) $(2x^3 - 3x^2 + 4x - 5) \div (x - 1)$

Question 7

Use the remainder theorem to find the remainder when:

(a) $x^3 - 4x^2 + 2x + 5$ is divided by $(x - 3)$

(b) $x^3 - 4x^2 + 2x + 5$ is divided by $(x + 2)$

(c) $2x^4 - x + 1$ is divided by $(2x - 1)$

Question 8

Let $P(x) = x^3 - 6x^2 + 11x - 6$.

(a) Show that $(x - 1)$ is a factor of $P(x)$.

(b) Factorise $P(x)$ fully.

Question 9

Let $P(x) = 2x^3 + 3x^2 - 11x - 6$.

(a) Show that $P(2) = 0$.

(b) Factorise $P(x)$ fully.

(c) Solve $P(x) = 0$.

Question 10

(a) When $x^3 + kx^2 - 4x + 3$ is divided by $(x - 2)$, the remainder is 7. Find k.

(b) $(x + 3)$ is a factor of $x^3 + 2x^2 + mx + 6$. Find m.

Polynomials and factor theorem: answers

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Question 1

Answer: (a) 3 (b) 4 (c) -7 (d) -2

Question 2

Answer: (a) yes (b) no, $2/x = 2x^{-1}$ has a negative power of x (c) no, √x = x^(½) is not a w hole number power (d) yes (coefficients may be fractions)

Question 3

Answer: (a) 2 (b) 4 (8 - 6 + 2) (c) 4 (-1 + 3 + 2)

Question 4

Answer: $x^3 - x^2 - 5x + 2$

Question 5

Answer: (a) $3x^3 - 2x^2 - 5x + 6$ (b) $x^3 + 4x^2 - 5x + 2$ (c) 6 (3 + 3)

Question 6

Answer: (a) quotient $x^2 + 4x + 3$, remainder 0 (b) quotient $2x^2 - x + 3$, remainder -2

Question 7

Answer: (a) 2 (27 - 36 + 6 + 5) (b) -23 (-8 - 16 - 4 + 5) (c) ⅝ (P(½) = ⅛ - ½ + 1)

Question 8

Answer: (a) P(1) = 1 - 6 + 11 - 6 = 0, so (x - 1) is a factor (b) (x - 1)(x - 2)(x - 3)

Question 9

Answer: (a) 16 + 12 - 22 - 6 = 0 (b) (x - 2)(2x + 1)(x + 3) (c) x = 2, x = -½ or x = -3

Question 10

Answer: (a) k = 1 (8 + 4k - 8 + 3 = 7) (b) m = -1 (-27 + 18 - 3m + 6 = 0)