

Polynomial Functions: math test solutions, Grade 11 – download the PDF

Test solutions with the detailed point scale. Add up your points and spot what to review.

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Operations with polynomials

/ 4 pts

a. $3x^2 - 4x + 1 - x^2 - 2x + 6 = 2x^2 - 6x + 7$ (1 pt).

b. $2x^3 + x^2 - 5x - 6x^2 - 3x + 15 = 2x^3 - 5x^2 - 8x + 15$ (2 pts).

c. $(2x - 3)(2x - 3) = 4x^2 - 12x + 9$ (1 pt).

2 Long division

/ 4 pts

$x^3 \div x = x^2$; $x^2(x + 5) = x^3 + 5x^2$; subtract: $-x^2 - 3x$ (1 pt).

$-x^2 \div x = -x$; $-x(x + 5) = -x^2 - 5x$; subtract: $2x + 12$ (1 pt).

$2x \div x = 2$; $2(x + 5) = 2x + 10$; subtract: 2 (1 pt).

$x^3 + 4x^2 - 3x + 12 = (x + 5)(x^2 - x + 2) + 2$ (1 pt).

3 Synthetic division and the Factor Theorem

/ 4 pts

- a. With $c = 3$: bring down 2; $-9 + 6 = -3$; $4 - 9 = -5$; $15 - 15 = 0$. Quotient $2x^2 - 3x - 5$, remainder 0 (2 pts).
- b. The remainder is 0, so $p(3) = 0$ and $x - 3$ is a factor by the Factor Theorem (1 pt).
- c. $2x^2 - 3x - 5 = (2x - 5)(x + 1)$, so $p(x) = (x - 3)(2x - 5)(x + 1)$ with zeros 3, $\frac{5}{2}$ and -1 (1 pt).

4 End behavior and zeros

/ 3 pts

- a. The degree is 5 (odd) and the leading coefficient is -2 (negative), so the graph rises on the left and falls on the right (2 pts).
- b. By the Fundamental Theorem of Algebra there are exactly 5 complex zeros, and there are at most $5 - 1 = 4$ turning points (1 pt).

5 Rational Root Theorem

/ 3 pts

- a. Divisors of 3: $\pm 1, \pm 3$; divisors of 2: $\pm 1, \pm 2$. Candidates: $\pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{3}{2}$ (1 pt).
- b. $p(1) = 2 + 3 - 8 + 3 = 0$ (1 pt). Synthetic division gives $2x^2 + 5x - 3 = (2x - 1)(x + 3)$, so the zeros are 1, $\frac{1}{2}$ and -3 (1 pt).

6 Difference of cubes

/ 2 pts

$8x^3 - 125 = (2x)^3 - 5^3$ (1 pt), so it equals $(2x - 5)(4x^2 + 10x + 25)$ (1 pt).



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