Unit 13 · Nonlinear Functions and Polynomials Cheat Sheet

Unit 13 focus: sequences, nonlinear graphs and exponential growth and decay

1 SEQUENCES

Type	Example
Arithmetic (add the same number)	5, 9, 13, 17 (+4)
Geometric (multiply by the same number)	3, 6, 12, 24 (×2)
Neither	1, 4, 9, 16 (squares)

2 NEXT TERMS

Find the common difference or ratio.

Example: 2, 6, 18, 54, ...
Ratio: × 3
Answer: 162, 486

3 GRAPHING NONLINEAR FUNCTIONS

Function	Shape
$y = x^2$	U-shaped parabola
$y = \|x\|$	V shape
$y = 2^x$	exponential curve

Make a table: for $y = x^2$, x = −2, 0, 2 gives y = 4, 0, 4.

4 EXPONENTIAL GROWTH

$y = a(1 + r)^t$

Example: $500 grows 6% per year for 3 years
Compute: $500(1.06)^3$
Answer: ≈ $595.51

5 EXPONENTIAL DECAY

$y = a(1 - r)^t$

Example: A $20,000 car loses 15% per year. Value after 2 years?
Compute: $20000(0.85)^2$
Answer: $14,450

6 QUICK REMINDERS & COMMON MISTAKES

✓ Do remember

- Linear: constant difference. Exponential: constant ratio.
- Growth uses 1 + r, decay uses 1 − r.
- Plot enough points to see the curve.

✗ Common mistakes

- Treating 2, 6, 18 as +4: × 3
- Decay with 1 + r: 1 − r
- Connecting a parabola with straight segments: smooth curve

Unit 13 · Nonlinear Functions and Polynomials Cheat Sheet

More practice: adding, subtracting and multiplying polynomials

1 KEY VOCABULARY

monomial	A number, a variable or their product.	$-5x^2$
polynomial	A sum of monomials.	$3x^2 + 2x - 7$
degree	Largest exponent.	degree of $4x^3 + x$ is 3
binomial	Two terms.	x + 5

2 ADDING POLYNOMIALS

Combine like terms.

Example: $(3x^2 + 2x - 5) + (x^2 - 6x + 4)$
Group: $(3x^2 + x^2) + (2x - 6x) + (-5 + 4)$
Answer: $4x^2 - 4x - 1$

3 SUBTRACTING POLYNOMIALS

Distribute the minus sign to EVERY term, then combine.

Example: $(5x^2 - 3x) - (2x^2 + x - 8)$
Distribute −: $5x^2 - 3x - 2x^2 - x + 8$
Answer: $3x^2 - 4x + 8$

4 POLYNOMIAL × MONOMIAL

Distribute; multiply coefficients and add exponents.

Example: $2x(3x^2 - 4x + 1)$
Distribute: $6x^3 - 8x^2 + 2x$
Answer: $6x^3 - 8x^2 + 2x$

5 MULTIPLYING BINOMIALS (FOIL)

First, Outer, Inner, Last, then combine.

Example: (x + 4)(x − 3)
FOIL: $x^2 - 3x + 4x - 12$
Answer: $x^2 + x - 12$

6 CHECK YOURSELF

- Did I distribute the minus to every term?
- Did I add exponents when multiplying?
- Did I combine like terms at the end?
- Is my answer in standard form (highest power first)?