

# Polynomial Functions: Zeros, Ends, and Graphs

Grade 11 – Algebra 2 math · Test · Standards: F-IF.C.7c, A-APR.B.3, F-IF.B.4

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

This test assesses the structure of polynomial functions: degree, end behavior, zeros, multiplicity, graph reading, and modeling. Show your reasoning, write factored forms where asked, and state domains with inequalities. No calculator is needed. The test is worth 20 points.

**Standards:** F-IF.C.7c, A-APR.B.3, F-IF.B.4 · **Level:** Grade 11 Algebra 2

Time: 45 minutes · 8 questions · Total: 20 points · Calculator: as allowed by your teacher

## Question 1 Degree and end behavior (2 points)

Consider  $f(x) = -4x^5 + 7x^3 - x + 9$ .

- State the degree and the leading coefficient. (1 point)
- Describe the end behavior. (1 point)

## Question 2 Zeros and multiplicity (2 points)

For  $f(x) = (x - 6)^2(x + 1)(2x + 9)^3$ , list each zero with its multiplicity and say whether the graph crosses or touches the axis there.

## Question 3 Factor to find zeros (2 points)

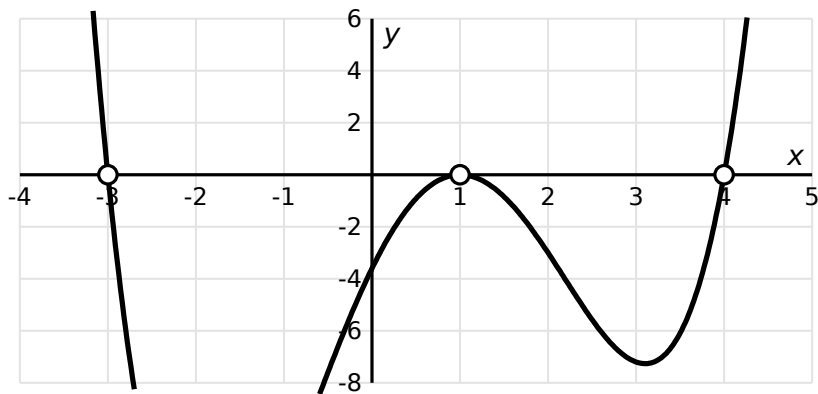
Find all zeros of  $f(x) = x^3 - 7x^2 + 10x$ .

## Question 4 Build a polynomial (3 points)

A cubic polynomial has zeros  $-4$ ,  $1$ , and  $3$ , and  $f(0) = -24$ . Write  $f(x)$  in standard form.

## Question 5 Read a graph (3 points)

The graph of a polynomial  $p$  is shown.



Graph of  $p$ .

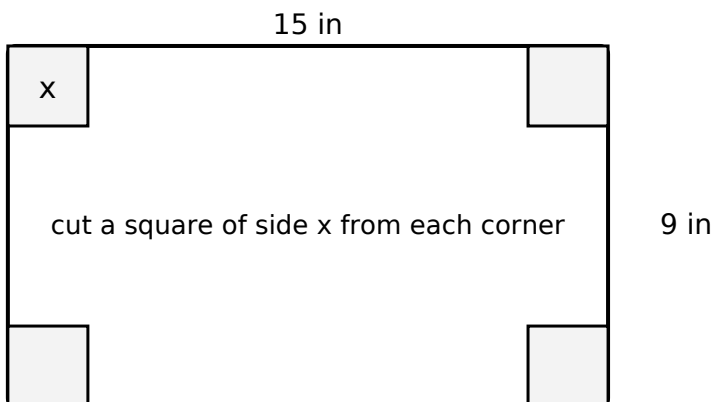
- List the zeros and identify the one with even multiplicity. (1 point)
- State the least possible degree and the sign of the leading coefficient. (1 point)
- Write a factored form that fits the graph. (1 point)

### Question 6 Sign analysis (3 points)

For  $f(x) = (x + 5)(x - 2)^2(x - 6)$ , find all  $x$  for which  $f(x) > 0$ .

### Question 7 Modeling an open box (3 points)

A sheet 15 inches by 9 inches has a square of side  $x$  inches cut from each corner, and the sides are folded up to form an open box.



The sheet before folding.

- Write the volume  $V(x)$  as a product of factors and state the domain. (1 point)
- Expand  $V(x)$  into standard form. (1 point)
- Compare  $V(1)$ ,  $V(2)$ , and  $V(3)$  and state which gives the greatest volume. (1 point)

### Question 8 Reasoning about graphs (2 points)

Answer each question and explain.

- a. Can a cubic polynomial have no real zeros? (*1 point*)
- b. Can a degree 5 polynomial have exactly 4 turning points? (*1 point*)