Match Polynomial Functions to Graphs Using Roots and End Behavior

Original tasks 1, 2 / complete keys

Task 1

Match g(x) = (x - 4)(x + 1)(x - 2) to one of these described graphs. Graph P: crosses at x = -1, 2, and 4; falls on the left and rises on the right. Graph Q: crosses at x = -1, 2, and 4; rises on both ends. Graph R: touches at x = 2 and crosses at x = -1 and 4; falls on the left and rises on the right.

Answer: Graph P.

Reason: The degree is 3 (odd), and the leading coefficient is positive, so the graph falls on the left and rises on the right. All three roots have multiplicity 1, so the graph crosses at x = -1, 2, and 4. Graph Q has even-degree end behavior; Graph R shows a touch at x = 2, which would require an even multiplicity.

Check: Evaluate g(0) = (0 - 4)(0 + 1)(0 - 2) = (-4)(1)(-2) = 8, which is positive. The matching graph should be above the x-axis at x = 0.

Task 2

Match h(x) = (x + 3)^2(x - 1) to one of these described graphs. Graph S: touches at x = -3, crosses at x = 1, falls on the left and rises on the right. Graph T: crosses at x = -3, touches at x = 1, falls on both ends. Graph U: touches at x = -3, crosses at x = 1, falls on both ends.

Answer: Graph S.

Reason: The degree is 2 + 1 = 3, which is odd, and the leading coefficient is positive, so the graph falls on the left and rises on the right. The factor (x + 3)^2 gives a touch at x = -3, and (x - 1) gives a crossing at x = 1. Graph T has the multiplicities reversed and the wrong end behavior; Graph U has the wrong end behavior for a positive leading coefficient.

Check: Evaluate h(0) = (3)^2(-1) = -9, which is negative, so the graph should be below the x-axis at x = 0.

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Original tasks 3, 4 / complete keys

Task 3

Match k(x) = -2(x - 1)(x + 2)(x - 3) to one of these described graphs. Graph V: crosses at x = -2, 1, and 3; rises on the left and falls on the right. Graph W: crosses at x = -2, 1, and 3; falls on the left and rises on the right. Graph X: touches at x = 1 and crosses at x = -2 and 3; rises on the left and falls on the right.

Answer: Graph V.

Reason: The degree is 3 (odd), and the leading coefficient is -2, which is negative, so the graph rises on the left and falls on the right. All roots have multiplicity 1, so the graph crosses at x = -2, 1, and 3. Graph W has the wrong end behavior for a negative leading coefficient; Graph X shows a touch at x = 1, which is incorrect.

Check: Evaluate k(0) = -2(-1)(2)(-3) = -2(6) = -12, which is negative, so the graph should be below the x-axis at x = 0.

Task 4

Match m(x) = (x - 2)^2(x + 1)^2 to one of these described graphs. Graph Y: touches at x = -1 and x = 2, rises on both ends. Graph Z: crosses at x = -1 and x = 2, falls on both ends. Graph AA: touches at x = -1 and x = 2, falls on both ends.

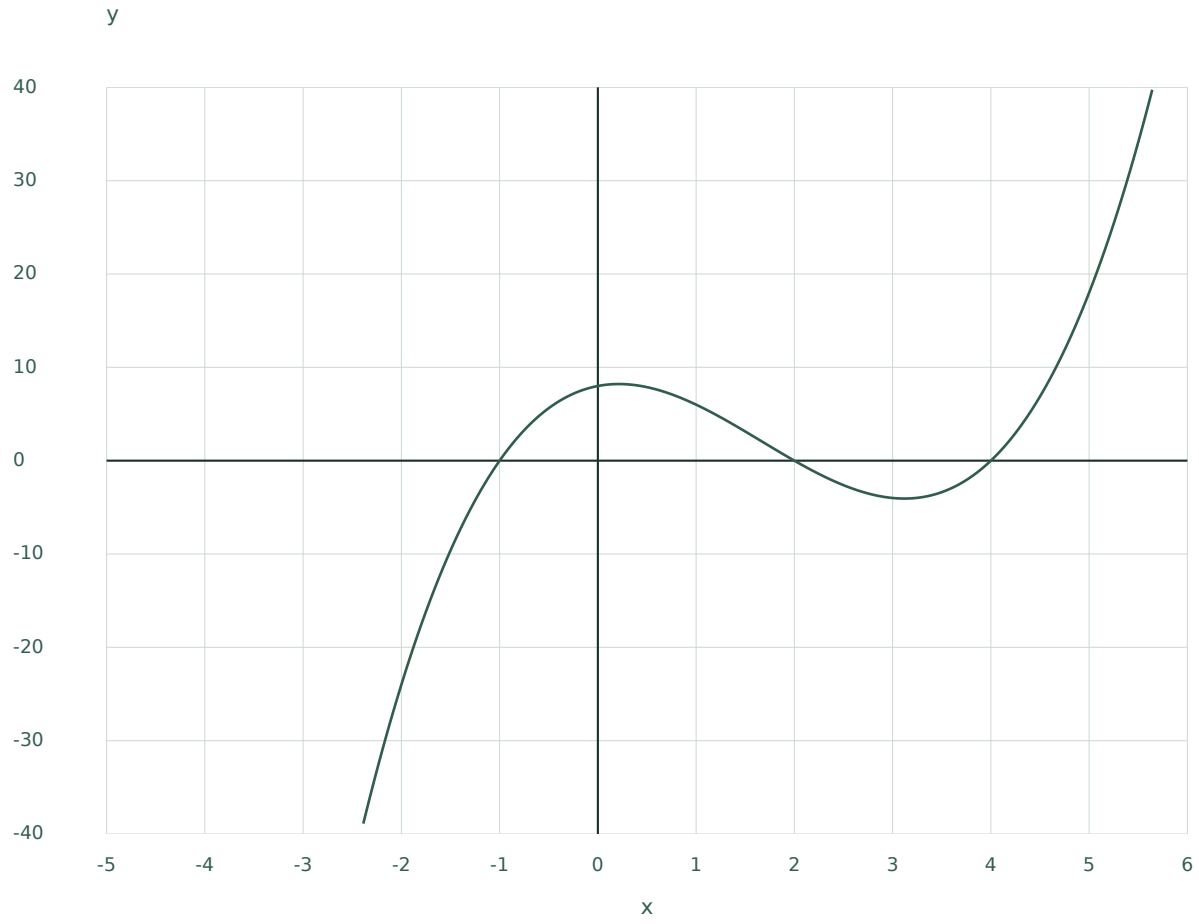
Answer: Graph Y.

Reason: The degree is 2 + 2 = 4, which is even, and the leading coefficient is positive, so the graph rises on both ends. Both factors have even multiplicity, so the graph touches at x = -1 and x = 2 without crossing. Graph Z shows crossings, which is wrong; Graph AA has the wrong end behavior for a positive leading coefficient.

Check: Evaluate m(0) = (-2)^2(1)^2 = 4, which is positive, so the graph should be above the x-axis at x = 0.

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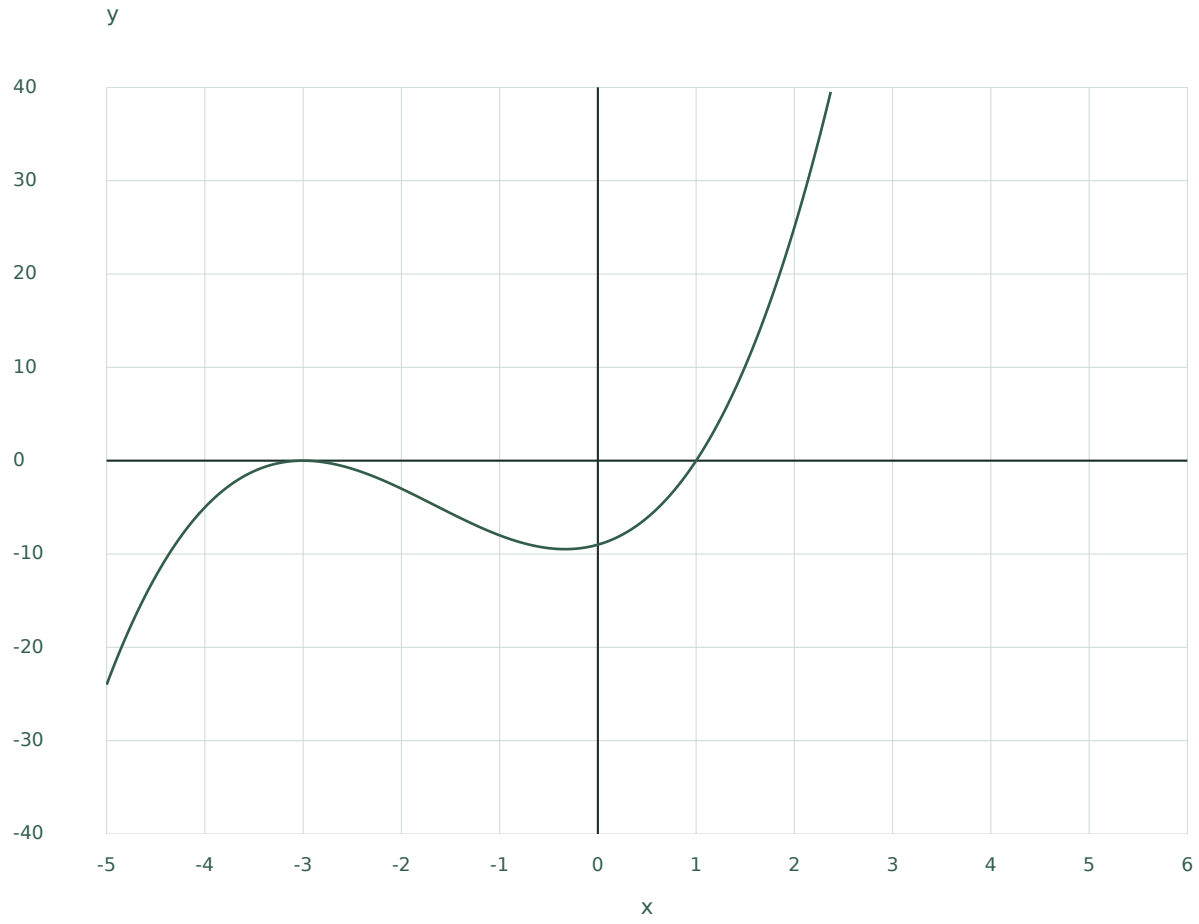
Task 1 / graph key



Answer function graph. Candidate descriptions remain literal in the original question; roots, multiplicities and end behavior determine the match.

Match Polynomial Functions to Graphs Using Roots and End Behavior

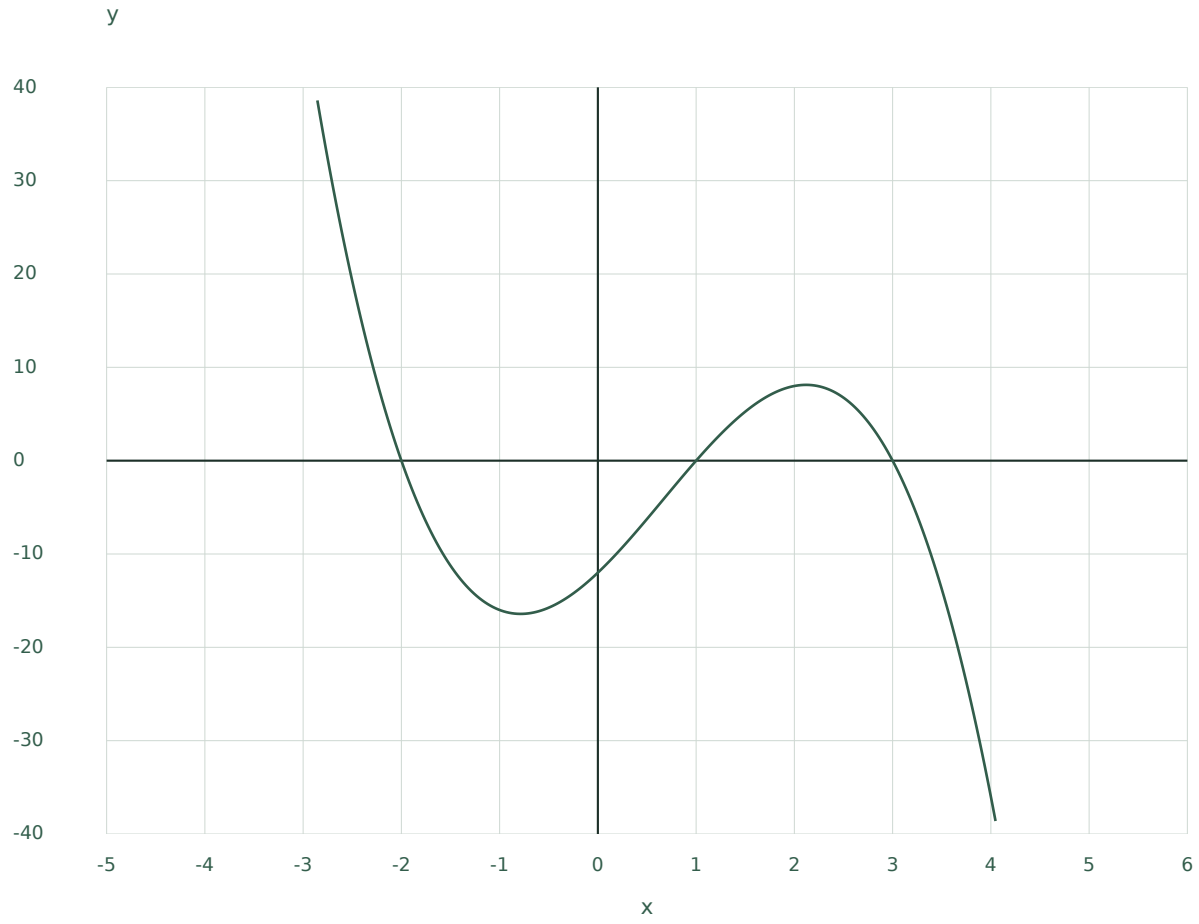
Task 2 / graph key



Answer function graph. Candidate descriptions remain literal in the original question; roots, multiplicities and end behavior determine the match.

Match Polynomial Functions to Graphs Using Roots and End Behavior

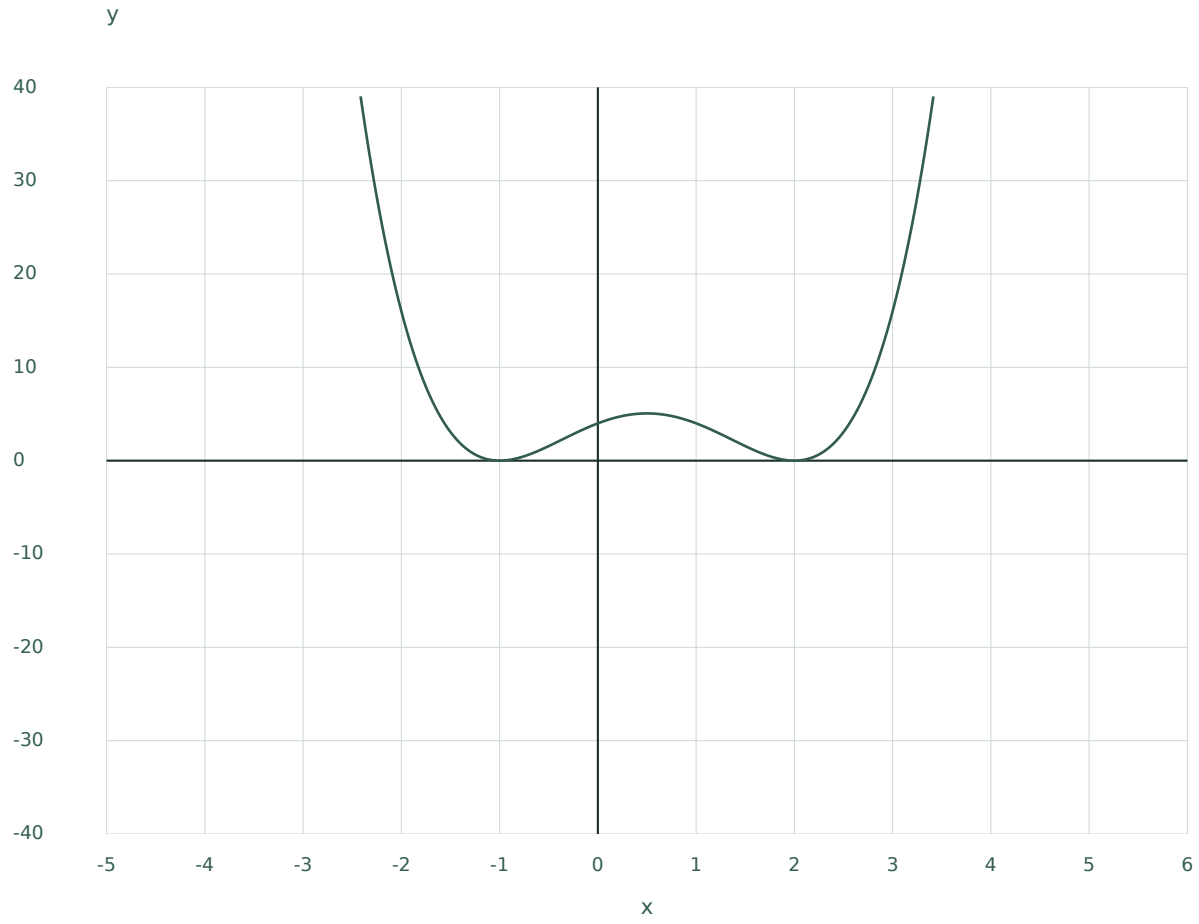
Task 3 / graph key



Answer function graph. Candidate descriptions remain literal in the original question; roots, multiplicities and end behavior determine the match.

Match Polynomial Functions to Graphs Using Roots and End Behavior

Task 4 / graph key



Answer function graph. Candidate descriptions remain literal in the original question; roots, multiplicities and end behavior determine the match.

Match Polynomial Functions to Graphs Using Roots and End Behavior

Source rubric / reflection

- [ ] Degree correctly counted from exponents, including multiplicities.
- [ ] Each root listed with correct multiplicity and crossing or touching behavior.
- [ ] End behavior direction stated for both left and right ends.
- [ ] Candidate graphs eliminated with a stated reason, not by guesswork.
- [ ] Final match supported by at least one test-point or y-intercept check.
- [ ] Arithmetic at test points is correct and units are consistent.

Reflection: What did you check, what did you change, and what will you try next?