ALGEBRA 2 • POLYNOMIAL FUNCTIONS

Polynomial Multiple-Representations Activity

Students do not match finished cards. They complete missing representations, explain what each clue proves, and check that all eight views describe the same function.

8 organizers
quadratic through fifth degree

3 levels
guided, standard, challenge

25–55 min
one lesson or selected pages

Student routine

1. Mark the boxes that were given to you.
2. Complete the easiest missing representation first.
3. Move back and forth between factors, zeros, graph behavior, and end behavior.
4. Use one extra test point before calling the organizer finished.

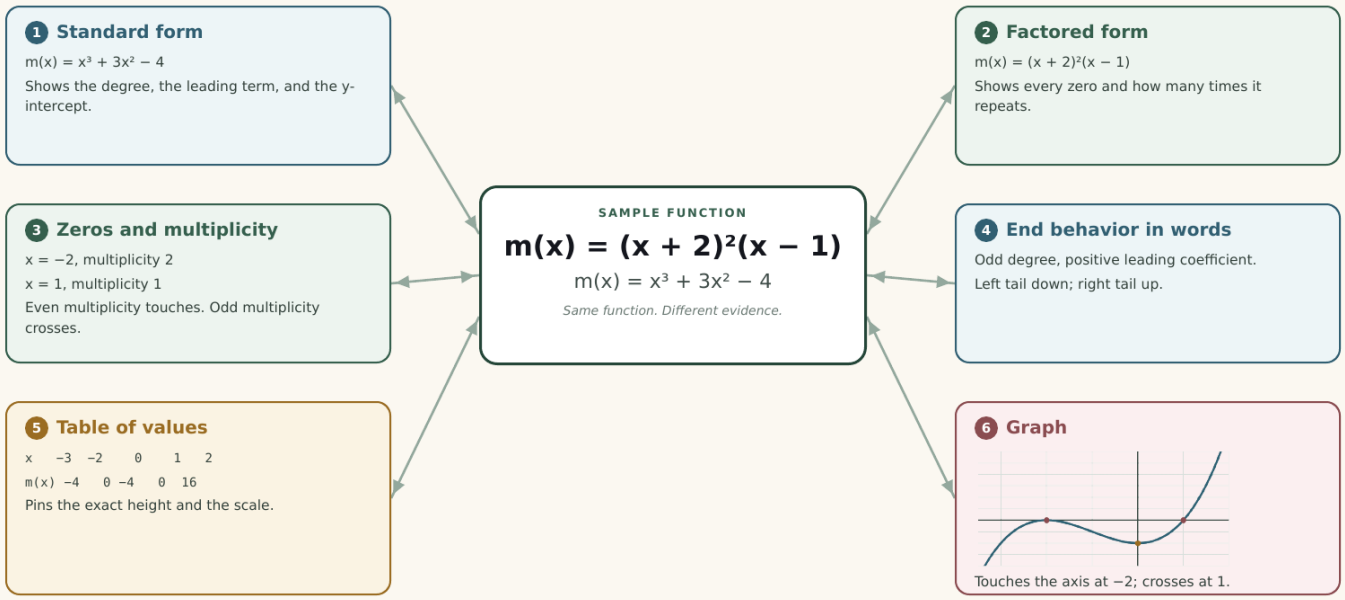
Read the given clues first. Some pages hand you the degree or a single point. Those are not decoration — without them the function would not be pinned down, and the leading coefficient could be any size.

Reference: Six Ways to Understand a Polynomial Function

Keep this page beside the activity. Every arrow runs both directions, so any view can be used to check any other.

Six Ways to Understand a Polynomial Function

One function. Six connected views. Every arrow runs both directions — each view can check any other.



Burke Tutoring in Fremont • Free classroom organizer • burketutoringinfremont.com/polynomial-multiple-representations-worksheet/

What each view proves

- **Standard form** gives the degree, the leading term, and the y-intercept at a glance.
- **Factored form** gives every zero and its multiplicity.
- **Zeros and multiplicity** decide crossing, touching, and flattening.

What no single view proves

- **End behavior** gives the *sign* of the leading coefficient, never its size.
- **A graph** without a labelled point cannot pin the vertical scale.
- That is why one supplied point, or the y-intercept, does the last piece of work on every sparse page.

GUIDED

Name _____

Date _____

Function A: Complete the Missing Representations

Two equation forms are filled in. Use them to build every other view.

Standard form — GIVEN

$f(x) = x^2 + x - 2$

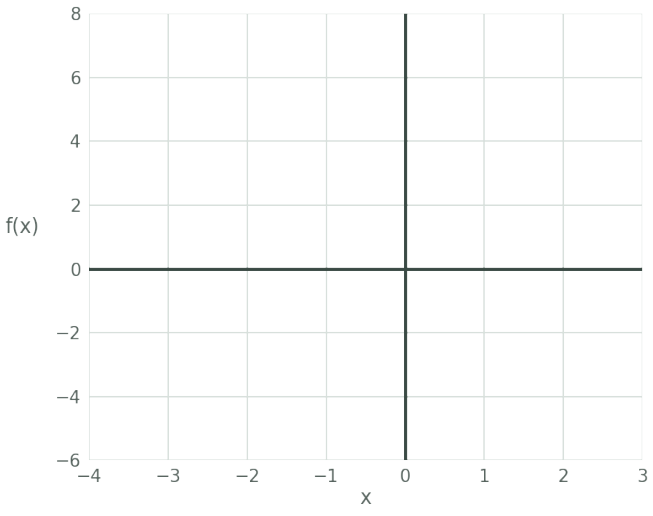
Factored form — GIVEN

$f(x) = (x + 2)(x - 1)$

Table — COMPLETE

x	−3	−2	0	1	2
f(x)					

Graph — COMPLETE



Zeros — COMPLETE

Multiplicity and intercept behavior — COMPLETE

End behavior — COMPLETE

Verbal description — COMPLETE

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____

GUIDED

Name _____

Date _____

Function B: Complete the Missing Representations

The graph, table, and degree are complete. Work backward to the equations and structure.

Given clue: Degree 3

Standard form — COMPLETE

Zeros — COMPLETE

Factored form — COMPLETE

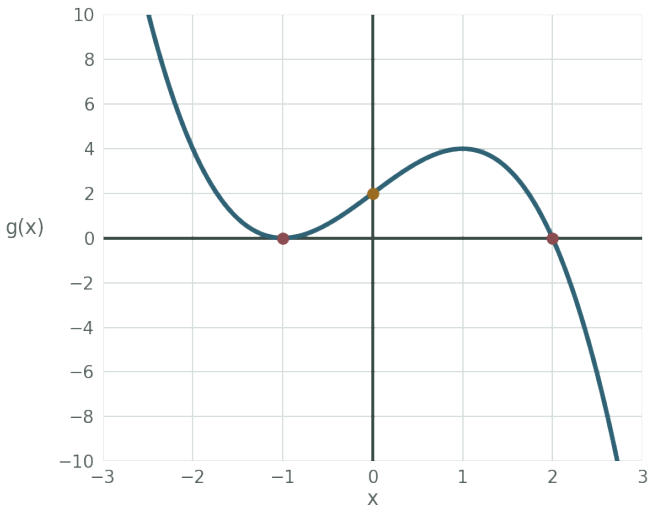
Multiplicity and intercept behavior — COMPLETE

Table — GIVEN

x	−2	−1	0	1	2
g(x)	4	0	2	4	0

End behavior — COMPLETE

Graph — GIVEN



Verbal description — COMPLETE

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____

STANDARD

Name _____

Date _____

Function C: Complete the Missing Representations

Zeros, multiplicities, tails, and one point are enough. Find the scale before expanding.

Given clue: Degree 3

Given clue: h(0) = 4

Standard form — COMPLETE

_____

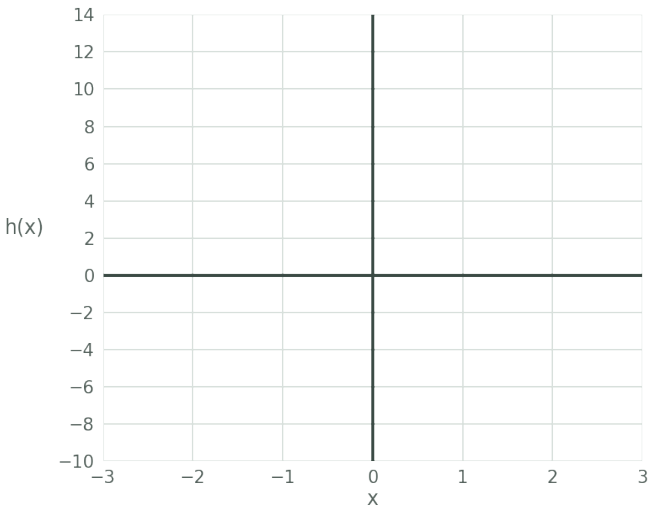
Factored form — COMPLETE

_____

Table — COMPLETE

x	−2	−1	0	1	2
h(x)					

Graph — COMPLETE



Zeros — GIVEN

x = −2 and x = 1

Multiplicity and intercept behavior — GIVEN

x = −2 has multiplicity 1; x = 1 has multiplicity 2.

End behavior — GIVEN

As x → −∞, h(x) → −∞. As x → ∞, h(x) → ∞.

Verbal description — COMPLETE

_____

_____

_____

_____

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____

STANDARD

Name _____

Date _____

Function D: Complete the Missing Representations

The standard form hides the zeros. The graph gives you a place to start factoring.

Standard form — GIVEN

$p(x) = -x^4 + 5x^2 - 4$

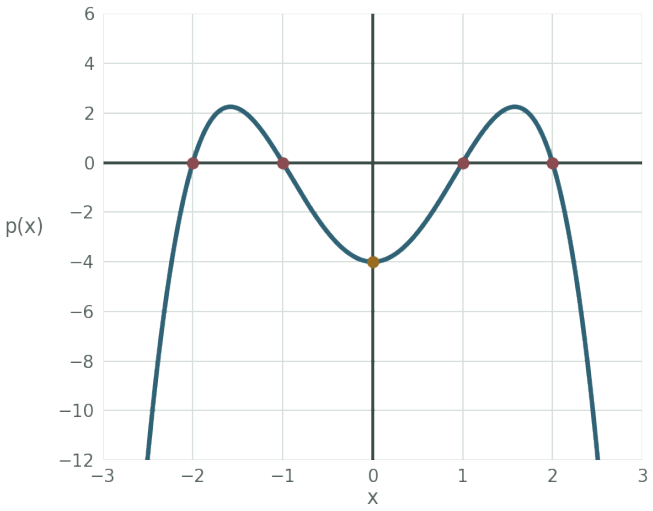
Factored form — COMPLETE

_____

Table — COMPLETE

x	−3	−2	−1	0	1	2	3
p(x)							

Graph — GIVEN



Zeros — COMPLETE

_____

Multiplicity and intercept behavior — COMPLETE

_____

_____

_____

End behavior — COMPLETE

_____

_____

_____

Verbal description — COMPLETE

_____

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_____

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____

STANDARD

Name _____

Date _____

Function E: Complete the Missing Representations

The factors show the intercept behavior. Use the table to check the height and symmetry.

Standard form — COMPLETE

Zeros — COMPLETE

Factored form — GIVEN

$q(x) = (x + 1)^2(x - 2)^2$

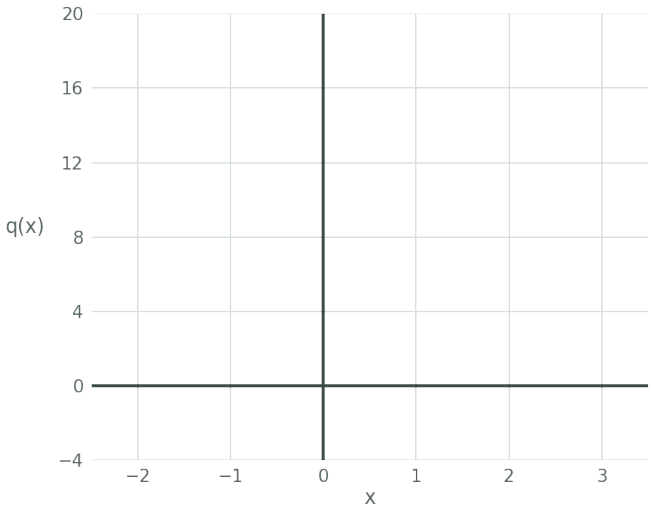
Multiplicity and intercept behavior — COMPLETE

Table — GIVEN

x	−2	−1	0	1	2	3
q(x)	16	0	4	4	0	16

End behavior — COMPLETE

Graph — COMPLETE



Verbal description — COMPLETE

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____

CHALLENGE

Name _____

Date _____

Function F: Complete the Missing Representations

Turn the description into factors first. The y-intercept determines the leading coefficient.

Given clue: r(0) = −2

Standard form — COMPLETE

Zeros — COMPLETE

Factored form — COMPLETE

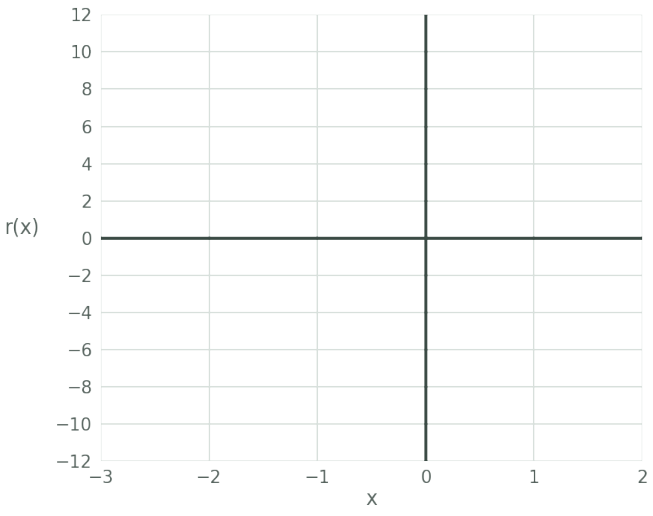
Multiplicity and intercept behavior — COMPLETE

Table — COMPLETE

x	−2	−1	0	1	2
r(x)					

End behavior — COMPLETE

Graph — COMPLETE



Verbal description — GIVEN

A positive fifth-degree function. It touches at −2, crosses with flattening at 1, and passes through (0, −2).

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____

CHALLENGE

Name _____

Date _____

Function G: Complete the Missing Representations

Build $k(x - r)^m$ from the structure, then use the point to solve for k.

Given clue: Degree 5

Given clue: $s(0) = -4$

Standard form — COMPLETE

_____

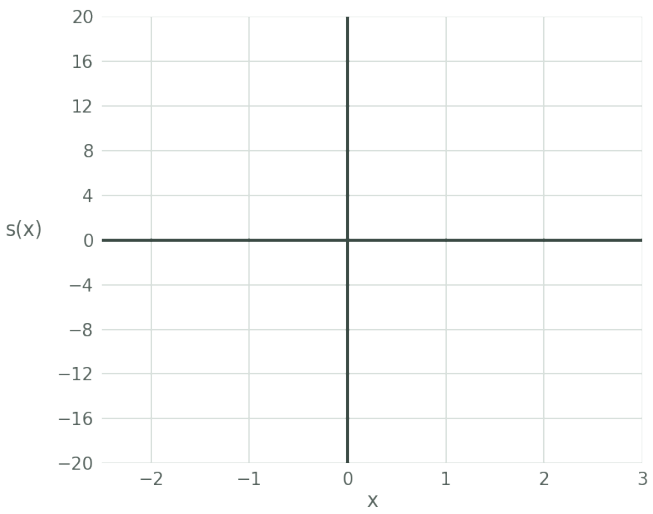
Factored form — COMPLETE

_____

Table — COMPLETE

x	−2	−1	0	1	2
s(x)					

Graph — COMPLETE



Zeros — GIVEN

$x = -1$ and $x = 2$

Multiplicity and intercept behavior — GIVEN

$x = -1$ has multiplicity 3; $x = 2$ has multiplicity 2.

End behavior — GIVEN

As $x \to -\infty$, $s(x) \to \infty$. As $x \to \infty$, $s(x) \to -\infty$.

Verbal description — COMPLETE

_____

_____

_____

_____

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____

CHALLENGE

Name _____

Date _____

Function H: Complete the Missing Representations

Only the factored form is supplied. Complete all seven remaining representations.

Standard form — COMPLETE

Zeros — COMPLETE

Factored form — GIVEN

$t(x) = (1/2) \cdot (x + 3)(x + 1)^2(x - 2)$

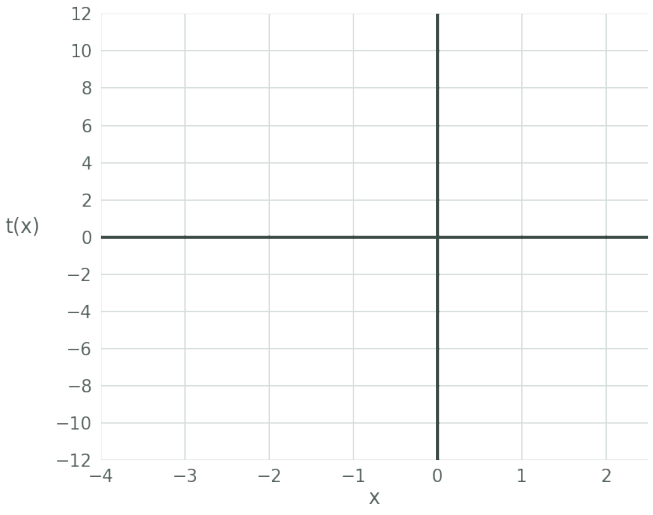
Multiplicity and intercept behavior — COMPLETE

Table — COMPLETE

x	−3	−2	−1	0	1	2
t(x)						

End behavior — COMPLETE

Graph — COMPLETE



Verbal description — COMPLETE

One check before you move on

Choose a point that was not handed to you. Substitute it into your equation and make sure it lands on your table or graph.

x = _____ output = _____ agrees? _____