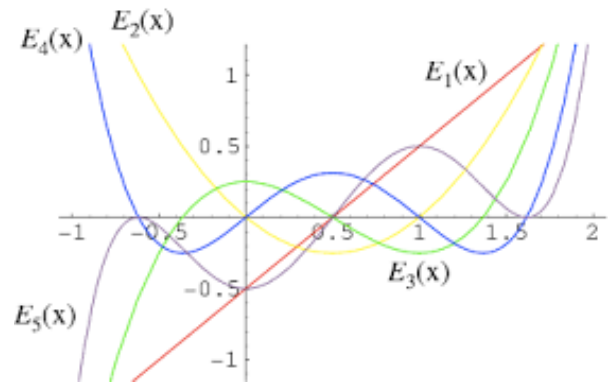


Mathematician's Guide to Polynomial Functions

You have learned a lot of interesting aspects of polynomial functions such as end behavior, intercepts, repeated solutions, imaginary solutions, turning points, and more! You learned how to graph/sketch and write polynomial functions using different methods. You also learned how to add, subtract, multiply, divide, factor, and solve polynomials. Do not forget all of the theorems we studied like the Remainder Theorem, The Factor Theorem, Rational Root Theorem, Fundamental Theorem of Algebra, Irrational Conjugates Theorem, and the Complex Conjugates Theorem. Now you will organize all this knowledge into a neat guide. Have fun and make it work for you. Examples are helpful to illustrate how you do something.



FACTS (about polynomials):

1. What is a polynomial? Label the leading coefficient, degree, and constant term. What is standard form?

2. How do we name the different types of polynomials based on their degree? Examples are always a helpful tool.

MANIPULATING POLYNOMIALS LIKE ITS NO ONE'S BUSINESS...

Adding and Subtracting Polynomials:

3. How do you add or subtract polynomials? What methods could you use? (Hint: examples are a plus!)

Multiplying Polynomials:

4. How do you multiply polynomials? What methods could you use? (Hint: examples are a plus!)

5. How do you simplify (a) $(a + b)(a - b)$, (b) $(a + b)^2$, (c) $(a - b)^2$, (d) $(a + b)^3$, (e) $(a - b)^3$?

Dividing Polynomials:

6. How do you divide polynomials using long division? (Hint: examples are super helpful!)

7. How do you divide polynomials using synthetic division? (Hint: examples are super helpful!)

Evaluating Polynomials:

8. How do you evaluate polynomials? What methods could you use (we talked about two)?

Factoring Polynomials:

9. How do you factor a polynomial completely using (a) just good ol' factoring, and (b) using snazzy synthetic division? (include some examples)

10. How do you factor (a) $a^3 + b^3$, and (b) $a^3 - b^3$? (include some examples)

11. How do you factor by grouping? (include some examples)

12. What is quadratic form? How do you factor a polynomial in quadratic form? (include some examples)

Solving Polynomials:

13. How do you solve/find zeros a polynomial algebraically (hint: there are two algebraic methods we talked about)? (examples are nice)

Graphing Galore!

14. What is end behavior?

15. Describe the “End Behavior of Polynomial Functions.” You may want to make a nice chart that includes diagrams.

16. What is a repeated solution? What do repeated solutions look like on a graph?

17. What is an imaginary solution? What do imaginary solutions look like on a graph? What is special about all imaginary solutions *always*?

18. How do you figure out the number and type of solutions of a polynomial function?

19. How do you find the zeros of a polynomial function on a graph?

20. What is a turning point? How do you find the turning points of a polynomial function on a graph?

Sketching Like an ~~Artist~~ Mathematician

21. How do you *sketch* (not legit graph) a polynomial function?

Ok Example: Sketch a graph of the polynomial function.

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

B. $f(x) = x^2(x - 2)^2$

Challenging Example: Sketch a graph of the polynomial function f having these characteristics.

- f is increasing when $x < 0$ and $x > 4$
- f is decreasing when $0 < x < 4$
- $f(x) > 0$ when $-2 < x < 3$ and $x > 5$
- $f(x) < 0$ when $x < -2$ and $3 < x < 5$

Legit Graphing like a BO\$\$

22. How do you graph a polynomial function (for realsies)? What work should you write?

Writing Polynomials

23. How do you write a polynomial function using a graph and/or the x -intercepts?

24. How do you write a polynomial function using the Irrational Conjugates Theorem?

25. How do you write a polynomial function using the Complex Conjugates Theorem?

Theorems to Think About i.e. keep in mind

26. What theorem tells you that synthetic division can be used to evaluate a polynomial function? State that theorem.

27. What theorem helps you determine whether a binomial is a factor of a polynomial? State that theorem.

28. What theorem can be a starting point for finding possible solutions of polynomial equations? State the theorem.

29. What is the Irrational Conjugates Theorem? Complex Conjugates Theorem?

30. What is the Fundamental Theorem of Algebra?