

NOTES: SYNTHETIC SUBSTITUTION

DAY 3

Textbook Chapter 5.2

OBJECTIVE: Today you will learn about how to evaluate a function using synthetic substitution and also how to write a model for a polynomial function.

METHOD 1: Evaluate by Direct Substitution

Use **Direct Substitution** to evaluate $f(x) = -3x^3 + x^2 - 12x - 5$ when $x = -2$

METHOD 2: Evaluate by Synthetic Substitution

Use **Synthetic Substitution** to evaluate $f(x) = -3x^3 + x^2 - 12x - 5$ when $x = -2$

$$\begin{array}{r|rrrrr} -2 & & -3 & 1 & -12 & -5 \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \end{array}$$

1. Bring Down
2. Multiply and Add
3. Multiply and Add
4. Multiply and Add...

Use **Synthetic Substitution** to evaluate $f(x) = -2x^4 - x^3 + 4x - 5$ when $x = -1$

**Write the coefficients of $f(x)$ in order of descending exponents (*there is $0x^2$*)

$$\begin{array}{r|rrrrr} & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \end{array}$$

NOTES: MODELING POLYNOMIAL FUNCTIONS

Textbook Chapter 5.7

The Fundamental Theorem of Algebra

An n^{th} degree polynomial function has exactly _____ solutions.

1. $x^4 + 8x^2 - 2x + 2 = 0$ Number of zeros: _____ Number of real zeros: _____

2. $g(x) = x^3 - x^2 - 3x - 3$ Number of zeros: _____ Number of real zeros: _____

Complex Conjugate Theorem

If f is a polynomial function, and $a + bi$ is an imaginary zero, then $a - bi$ must also be a zero.

If f is a polynomial function, and $a + \sqrt{b}$ is an irrational zero, then $a - \sqrt{b}$ must also be a zero.

Given a zero, identify another zero

3. $-\sqrt{5}$ _____ 4. $6 - 2i$ _____ 5. $-3 - 2\sqrt{7}$ _____ 6. $3i$ _____

Write a Polynomial Function given the Zeros

7. Find the polynomial with a leading coefficient of 2 that has the given zeros: 4, 1, -2

Write $f(x)$ in factored form: _____

Change to Standard Form:

8. Find the polynomial with a leading coefficient of 1 that has the given zeros: 5, 3, -2i

Write $f(x)$ in factored form: _____

Change to Standard Form:

PRACTICE: SYNTHETIC SUBSTITUTION

DAY 3

Evaluate with synthetic substitution.

1. $f(x) = 2x^4 - 5x^3 - 4x + 8$ for $x = 3$

2. $f(x) = x^3 - 2x^2 - 23x + 60$ for $x = 3$

Given Factors, Identify the Zeros

3. $(x - 5)(x - 2)$ _____

4. $(x + 6)^2$ _____

5. $3x(x - 2)$ _____

6. $4x^3(2x - 1)$ _____

7. $(3x - 1)(6x + 5)$ _____

Given a List of Zeros, write as a List of Factors

8. 7 _____

9. $x = -2$ _____

10. $x = 5, -8$ _____

11. $x = \pm 6$ _____

12. $x = \pm 2\sqrt{3}$ _____

13. $x = \frac{2}{3}$ _____

14. $x = -\frac{7}{3}$ _____

15. $x = -\frac{1}{4}, 5$ _____

Given one zero, find another other zero.

16. $x = 2 + 5i$ _____

17. $x = 3 - \sqrt{5}$ _____

18. $x = \sqrt{11}$ _____

19. $x = -8i$ _____

20. Write the polynomial function (in factored form) with leading coefficient 1 and the following zeros: $-2, 3, 4$

21. Write the polynomial function (in standard form) with leading coefficient 2 and the following zeros: $5, 2i$

22. Write the polynomial function (in standard form) with leading coefficient 2 and the following zeros: $5, \sqrt{3}$

23. Use your calculator to graph the function:

Number of zeros: _____

Number of real zeros: _____