

5.4 The Remainder and Factor Theorems · Form A

All work must be completed in a clear and organized manner on a separate sheet of paper. Final answers only, boxed in on this sheet.

Example 1

Use synthetic substitution to find $f(-5)$ and $f(2)$ for each function.

1. $f(x) = x^2 - 8x + 6$

$$\begin{array}{r} 71 \\ \underline{-1} \quad 1 \end{array}, -6$$

3. $f(x) = x^5 + 8x^3 + 2x - 15$

$$\begin{array}{r} -4150 \\ \underline{-4} \quad 50 \end{array}, 85$$

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

$$\begin{array}{r} -435 \\ \underline{-8} \quad 5 \end{array}, -15$$

4. $f(x) = x^4 - 6x - 8$

$$\begin{array}{r} 647 \\ \underline{-6} \quad 7 \end{array}, -4$$

Use synthetic substitution to find $f(2)$ and $f(-1)$ for each function.

5. $f(x) = x^2 - x + 1$

$$\begin{array}{r} 3 \\ \underline{+1} \quad 3 \end{array}$$

7. $f(x) = x^3 + 6x^2 + x - 4$

$$\begin{array}{r} 30 \\ \underline{+6} \quad 0 \end{array}$$

8. $f(x) = x^4 - 3x^3 + 2x^2 - 2x + 6$

$$\begin{array}{r} 2 \\ \underline{-3} \quad 14 \end{array}$$

6. $f(x) = x^3 + 2x^2 + 5$

$$\begin{array}{r} 21 \\ \underline{+2} \quad 6 \end{array}$$

7. $f(x) = x^3 - 5x^2 - x + 6$

$$\begin{array}{r} -8 \\ \underline{-5} \quad 1 \end{array}$$

9. $f(x) = x^6 - 2x^5 + x^4 + x^3 - 9x^2 - 20$

$$\begin{array}{r} -32 \\ \underline{-2} \quad 6 \end{array}$$

Example 2

- 10.
- PROFIT**
- The profit, in thousands, of Clyde's Corporation can be modeled by

$P(y) = y^4 - 4y^3 + 2y^2 + 10y - 200$, where y is the number of years after the business was started.

Predict the profit of Clyde's Corporation after 10 years. $\$61,100,000$

Example 3

Given a polynomial and one of its factors, find the remaining factors of the polynomial.

11. $x^4 + 2x^3 - 8x - 16; x + 2$

$$\begin{array}{r} x-3 \\ \underline{(x+1)(x+1)}(x-1) \end{array}$$

13. $2x^3 + 7x^2 - 53x - 28; x - 4$

$$(x-4)(x+7)(2x+1)$$

15. $x^3 + x^2 - 5x + 3; x - 1$

$$(x-1)(x-1)(x+3)$$

17. $x^3 - 6x^2 + 32; x - 4$

$$(x-4)(x+2)(x-4)$$

19. $2x^3 + x^2 - 5x + 2; x + 2$

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

21. $16x^5 - 32x^4 - 81x + 162; 2x - 3$

$$(2x-3)(x-2)(2x+3)(4x^2+9)$$

12. $x^3 - x^2 - 5x - 3; x - 3$

$$(x-3)(x+1)(x-1)$$

14. $3x^3 - 19x^2 - 15x + 7; x - 7$

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

16. $x^3 - 6x^2 + 11x - 6; x - 3$

$$(x-3)(x-1)(x-2)$$

18. $x^3 - 19x + 30; x - 2$

$$(x-2)(x-3)(x+5)$$

19. $3x^3 + x^2 + x - 2; 3x - 2$

$$(3x-2)(\underbrace{x^2+x+1}_{\text{prime}})$$

Mixed Exercises

- 22.
- STATE YOUR ASSUMPTION**
- The revenue from streaming music services in the United States

from 2005 to 2016 can be modeled by $y = 0.26x^5 - 7.48x^4 + 79.20x^3 - 333.33x^2 + 481.68x + 99.13$, where x is the number of years since 2005 and y is the revenue in millions of U.S. dollars.

a. Estimate the revenue from streaming music services in 2010. 211.78

b. What might the revenue from streaming music services be in 2020? What assumption did you make to make your prediction?

$$18387.58$$