



Communicate

- Describe how the Factor Theorem can be used to determine whether $x + 1$ is a factor of $x^3 - 2x^2 - 8x - 5$.
- Describe the condition necessary to use synthetic division to divide polynomials.
- Explain how to use the Remainder Theorem to evaluate $P(5)$ if P is a polynomial function.

Guided Skills Practice

- Write $P(x) = x(10 - x)(2 + x)$ as a polynomial function in standard form.
(EXAMPLE 1)

Factor each polynomial. **(EXAMPLES 2 AND 3)**

- $x^3 - 5x^2 + 6x$
- $x^3 + 5x^2 + 3x + 15$
- $x^3 - 216$
- Use substitution to determine whether $x + 2$ is a factor of $x^3 + 4x^2 + 5x + 2$.
(EXAMPLE 4)
- Find the quotient. $(x^3 + 4x^2 + 4x + 3) \div (x^2 + x + 1)$ **(EXAMPLE 5)**

Given that -3 is a zero of $P(x) = x^3 - 14x - 15$, use each method below to factor $x^3 - 14x - 15$. **(EXAMPLE 6)**

- long division
- synthetic division

Given $P(x) = 2x^3 + 3x^2 + 4x + 1$, find $P(2)$ by using each method below.
(EXAMPLE 7)

- synthetic division
- substitution

Practice and Apply

Write each product as a polynomial in standard form.

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|----------------------------------|---------------------------------|
| 14. $3x^2(4x^3 - 2x^2 + 5x + 2)$ | 15. $2x^3(4x^3 - 2x^2 + x + 3)$ |
| 16. $(2x - 3)(x + 4)$ | 17. $(x + 7)(5x - 3)$ |
| 18. $(x + 2)(x^2 + 4x + 1)$ | 19. $(x + 3)(2x^3 + 3x^2 + 1)$ |
| 20. $(2x + 3)(x^3 - 5x^2 + 4)$ | 21. $(2x + 1)(x^2 - 4x - 3)$ |
| 22. $(x - 4)(2x^3 - 3x^2 + 2)$ | 23. $(x - 5)(-3x^3 - 4x - 1)$ |
| 24. $(x - 3)(2 - x)(x - 1)$ | 25. $(x - 2)(2x + 3)(3 - x)$ |
| 26. $(x + 1)^2(x - 2)$ | 27. $(2x - 4)(x + 1)^2$ |
| 28. $(2x + 1)^3$ | 29. $(3x + 2)^3$ |
| 30. $(x - 1)^2(x^2 - 3x + 2)$ | 31. $(-3x^2 - x + 2)(x + 1)^2$ |
| 32. $(x - 5)(2x^2 - 1 - 3)$ | 32. $(x - 1)(2x^2 - 1 - 2)$ |