

5

CHAPTER REVIEW

5.4 Factor and Solve Polynomial Equations

pp. 353–359

EXAMPLE

Factor the polynomial completely.

a. $x^3 + 125 = x^3 + 5^3 = (x + 5)(x^2 - 5x + 25)$

Sum of two cubes

b. $x^3 + 5x^2 - 9x - 45 = x^2(x + 5) - 9(x + 5)$

Factor by grouping.

$$= (x^2 - 9)(x + 5)$$

Distributive property

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

Difference of two squares

c. $3x^6 + 12x^4 - 96x^2 = 3x^2(x^4 + 4x^2 - 32)$

Factor common monomial.

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

Factor trinomial in quadratic form.

$$= 3x^2(x + 2)(x - 2)(x^2 + 8)$$

Difference of two squares

EXERCISES

Factor the polynomial completely.

21. $64x^3 - 8$

22. $2x^5 - 12x^3 + 10x$

23. $2x^3 - 7x^2 - 8x + 28$

24. **SCULPTURE** You have 240 cubic inches of clay with which to make a sculpture shaped as a rectangular prism. You want the width to be 4 inches less than the length and the height to be 2 inches more than 3 times the length. What should the dimensions of the sculpture be?

EXAMPLES

2, 3, 4, and 6

on pp. 354–356
for Exs. 21–24

5.5 Apply the Remainder and Factor Theorems

pp. 362–368

EXAMPLE

Divide $f(x) = 4x^4 + 29x^3 + 4x^2 - 14x + 37$ by $x + 7$.Rewrite the divisor in the form $x - k$. Because $x + 7 = x - (-7)$, $k = -7$.

$$\begin{array}{r|rrrrr} -7 & 4 & 29 & 4 & -14 & 37 \\ & & -28 & -7 & 21 & -49 \\ \hline & 4 & 1 & -3 & 7 & -12 \end{array}$$

So, $\frac{4x^4 + 29x^3 + 4x^2 - 14x + 37}{x + 7} = 4x^3 + x^2 - 3x + 7 - \frac{12}{x + 7}$.

EXERCISES

Divide.

25. $(x^3 - 3x^2 - x - 10) \div (x^2 + 3x - 1)$

26. $(4x^4 - 17x^2 + 9x - 18) \div (2x^2 - 2)$

27. $(2x^3 - 11x^2 + 13x - 44) \div (x - 5)$

28. $(5x^4 + 2x^2 - 15x + 10) \div (x + 2)$

Given polynomial $f(x)$ and a factor of $f(x)$, factor $f(x)$ completely.

29. $f(x) = x^3 - 5x^2 - 2x + 24$; $x + 2$

30. $f(x) = x^3 - 11x^2 + 14x + 80$; $x - 8$

31. $f(x) = 9x^3 - 9x^2 - 4x + 4$; $x - 1$

32. $f(x) = 2x^3 + 7x^2 - 33x - 18$; $x + 6$

EXAMPLES

1, 3, and 4

on pp. 362–364
for Exs. 25–32