PRACTICE & PROBLEM SOLVING

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Practice Tutorial

Additional Exercises Available Online

UNDERSTAND

8. Reason Write a polynomial division problem with a quotient of $x^2 - 5x + 7$ and a remainder of 2. Explain your reasoning. How can you verify your answer?

9. Communicate Precisely Show that $x - 3$ and $x + 5$ are factors of $x^4 + 2x^3 - 16x^2 - 2x + 15$. Explain your reasoning.

10. Error Analysis Alicia divided the polynomial $2x^3 - 4x^2 + 6x + 10$ by $x^2 + x$. Describe and correct the error Alicia made in dividing the polynomials.

$$2x - 6 + \frac{10}{x^2 + x}$$

$$x^2 + x \overline{)\,2x^3 - 4x^2 + 6x + 10}$$

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

$$-6x^2 + 6x$$

$$-(-6x^2 - 6x)$$

$$10$$

✗

11. Higher Order Thinking When dividing polynomial $P(x)$ by polynomial $d(x)$, the remainder is $R(x)$. The remainder can also be written as $\frac{R(x)}{d(x)}$. How can you use the degrees of $R(x)$ and $d(x)$ to determine you are finished dividing?

12. Look for Relationships When dividing polynomial $P(x)$ by polynomial $x - n$, the remainder is 0. When graphing $P(x)$, what is an x-intercept of the graph?

13. Reason When dividing $x^3 + nx^2 + 4nx - 6$ by $x + 3$, the remainder is -48. What is the value of n?

14. Mathematical Connections Use polynomial long division to divide $8x^3 + 27$ by $2x + 3$. How can you use multiplication to check your answer? Show your work.

PRACTICE

Use long division to divide. SEE EXAMPLE 1

15. $x^3 + 5x^2 - x - 5$ divided by $x - 1$

16. $2x^3 + 9x^2 + 10x + 3$ divided by $2x + 1$

17. $3x^3 - 2x^2 + 7x + 9$ divided by $x^2 - 3x$

18. $2x^4 - 6x^2 + 3$ divided by $2x - 6$

Use synthetic division to divide. SEE EXAMPLE 2

19. $x^4 - 25x^2 + 144$ divided by $x - 4$

20. $x^3 + 6x^2 + 3x - 10$ divided by $x + 5$

21. $x^5 + 2x^4 - 3x^3 + x - 1$ divided by $x + 2$

22. $-x^4 + 7x^3 + x^2 - 2x - 12$ divided by $x - 3$

23. Use synthetic division to show that the remainder of $f(x) = x^4 - 6x^3 - 33x^2 + 46x + 75$ divided by $x - 9$ is $P(9)$. SEE EXAMPLE 3

Use the Remainder Theorem to evaluate each polynomial for the given value of x. SEE EXAMPLE 4

24. $f(x) = x^3 + 9x^2 + 3x - 7$; $x = -5$

25. $f(x) = 2x^3 - 3x^2 + 4x + 13$; $x = 3$

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

27. $f(x) = x^5 - 3x^4 - 2x^3 + x^2 - 2x - 1$; $x = 4$

Is each given binomial a factor of the given polynomial? If so, write the polynomial as a product of two factors. SEE EXAMPLE 5

28. polynomial: $P(x) = 8x^3 - 10x^2 + 28x - 16$; binomial: $x - 3$

29. polynomial: $P(x) = 4x^4 - 9x^3 - 7x^2 - 2x + 25$; binomial: $x + 4$

30. polynomial: $P(x) = -x^5 + 12x^3 + 6x^2 - 23x + 1$; binomial: $x - 2$

31. polynomial: $P(x) = 2x^3 + 3x^2 - 8x - 12$; binomial: $2x + 3$

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Mixed Review Available Online

APPLY

32. Model With Mathematics Darren is placing shipping boxes in a storage unit with a floor area of $x^4 + 5x^3 + x^2 - 20x - 14$ square units. Each box has a volume of $x^3 + 10x^2 + 29x + 20$ cubic units and can hold a stack of items with a height of $x + 5$ units.

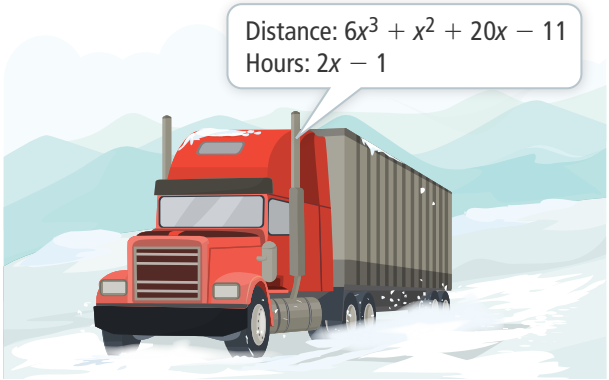
a. How much floor space will each box cover?

b. What is the maximum number of boxes Darren can place on the floor of the storage unit?

c. Assume Darren places the maximum number of boxes on the floor of the storage unit, with no overlap. How much of the floor space is not covered by a box?

33. Reason Lauren wants to determine the length and height of her DVD stand. The function $f(x) = x^3 + 14x^2 + 57x + 72$ represents the volume of the DVD stand, where the width is $x + 3$ units. What are possible dimensions for the length and height of the DVD stand? Explain.

34. Make Sense and Persevere A truck traveled $6x^3 + x^2 + 20x - 11$ miles in $2x - 1$ hours. At what rate did the semi-truck travel? (*Hint:* Use the formula $d = rt$, where d is the distance, r is the rate, and t is the time.)



ASSESSMENT PRACTICE

35. When polynomial $P(x)$ is divided by the linear factor $x - n$, the remainder is 0. What can you conclude? Select all that apply.

Ⓐ $P(x) = 0$
Ⓑ $P(n) = 0$
Ⓒ $P(-n) = 0$
Ⓓ $x - n$ is a factor of $P(x)$.
Ⓔ $x + n$ is a factor of $P(x)$.

36. SAT/ACT $x + 3$ is a factor of the polynomial $x^3 + 2x^2 - 5x + n$. What is the value of n?

Ⓐ -6
Ⓑ -3
Ⓒ -2
Ⓓ 3
Ⓔ 6

37. Performance Task The table shows some quotients of the polynomial $x^n - 1$ divided by the linear factor $x - 1$.

Dividend	Divisor	Quotient
$x^2 - 1$	$x - 1$	$x + 1$
$x^3 - 1$	$x - 1$	$x^2 + x + 1$
$x^4 - 1$	$x - 1$	
$x^5 - 1$	$x - 1$	
$x^6 - 1$	$x - 1$	

Part A Use long division or synthetic division to find the missing quotients to complete the table.

Part B Look for a pattern. Then describe the pattern when $x^n - 1$ is divided by $x - 1$.

Part C Use the pattern to find the quotient when $x^{10} - 1$ is divided by $x - 1$.