 Name_____

Adding and Subtracting Polynomials

Date_____ Period____

Simplify each expression.

1) $(5p^2 - 3) + (2p^2 - 3p^3)$

2) $(a^3 - 2a^2) - (3a^2 - 4a^3)$

3) $(4 + 2n^3) + (5n^3 + 2)$

4) $(4n - 3n^3) - (3n^3 + 4n)$

5) $(3a^2 + 1) - (4 + 2a^2)$

6) $(4r^3 + 3r^4) - (r^4 - 5r^3)$

7) $(5a + 4) - (5a + 3)$

8) $(3x^4 - 3x) - (3x - 3x^4)$

9) $(-4k^4 + 14 + 3k^2) + (-3k^4 - 14k^2 - 8)$

10) $(3 - 6n^5 - 8n^4) - (-6n^4 - 3n - 8n^5)$

11) $(12a^5 - 6a - 10a^3) - (10a - 2a^5 - 14a^4)$

12) $(8n - 3n^4 + 10n^2) - (3n^2 + 11n^4 - 7)$

13) $(-x^4 + 13x^5 + 6x^3) + (6x^3 + 5x^5 + 7x^4)$

14) $(9r^3 + 5r^2 + 11r) + (-2r^3 + 9r - 8r^2)$

15) $(13n^2 + 11n - 2n^4) + (-13n^2 - 3n - 6n^4)$

16) $(-7x^5 + 14 - 2x) + (10x^4 + 7x + 5x^5)$

17) $(7 - 13x^3 - 11x) - (2x^3 + 8 - 4x^5)$

18) $(13a^2 - 6a^5 - 2a) - (-10a^2 - 11a^5 + 9a)$

19) $(3v^5 + 8v^3 - 10v^2) - (-12v^5 + 4v^3 + 14v^2)$

20) $(8b^3 - 6 + 3b^4) - (b^4 - 7b^3 - 3)$

21) $(k^4 - 3 - 3k^3) + (-5k^4 + 6k^3 - 8k^5)$

22) $(-10k^2 + 7k + 6k^4) + (-14 - 4k^4 - 14k)$

23) $(-7n^2 + 8n - 4) - (-11n + 2 - 14n^2)$

24) $(14p^4 + 11p^2 - 9p^5) - (-14 + 5p^5 - 11p^2)$

25) $(8k + k^2 - 6) - (-10k + 7 - 2k^2)$

26) $(-9v^2 - 8u) + (-2uv - 2u^2 + v^2) + (-v^2 + 4uv)$

27) $(4x^2 + 7x^3y^2) - (-6x^2 - 7x^3y^2 - 4x) - (10x + 9x^2)$

28) $(-5u^3v^4 + 9u) + (-5u^3v^4 - 8u + 8u^2v^2) + (-8u^4v^2 + 8u^3v^4)$

29) $(-9xy^3 - 9x^4y^3) + (3xy^3 + 7y^4 - 8x^4y^4) + (3x^4y^3 + 2xy^3)$

30) $(y^3 - 7x^4y^4) + (-10x^4y^3 + 6y^3 + 4x^4y^4) - (x^4y^3 + 6x^4y^4)$

NAME _____ DATE _____ PERIOD _____

6-3 Skills Practice

Polynomial Functions

State the degree and leading coefficient of each polynomial in one variable. If it is not a polynomial in one variable, explain why.

1. $a + 8$

2. $(2x - 1)(4x^2 + 3)$

3. $-5x^5 + 3x^3 - 8$

4. $18 - 3y + 5y^2 - y^5 + 7y^6$

5. $u^3 + 4u^2t^2 + t^4$

6. $2r - r^2 + \frac{1}{r^2}$

Find $p(-1)$ and $p(2)$ for each function.

7. $p(x) = 4 - 3x$

8. $p(x) = 3x + x^2$

9. $p(x) = 2x^2 - 4x + 1$

10. $p(x) = -2x^3 + 5x + 3$

11. $p(x) = x^4 + 8x^2 - 10$

12. $p(x) = \frac{1}{3}x^2 - \frac{2}{3}x + 2$

If $p(x) = 4x^2 - 3$ and $r(x) = 1 + 3x$, find each value.

13. $p(a)$

14. $r(2a)$

15. $3r(a)$

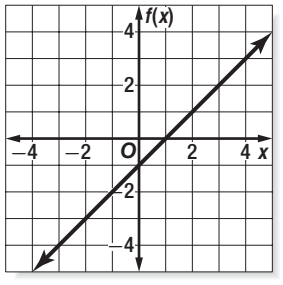
16. $-4p(a)$

17. $p(a^2)$

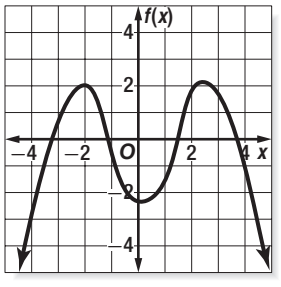
18. $r(x + 2)$

For each graph,
a. describe the end behavior,
b. determine whether it represents an odd-degree or an even-degree function, and
c. state the number of real zeroes.

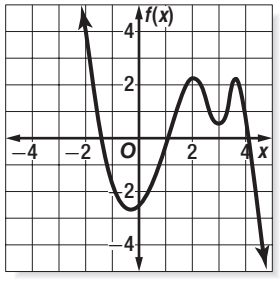
19.



20.



21.



NAME _____ DATE _____ PERIOD _____

6-3 Practice

Polynomial Functions

State the degree and leading coefficient of each polynomial in one variable. If it is not a polynomial in one variable, explain why.

1. $(3x^2 + 1)(2x^2 - 9)$

2. $\frac{1}{5}a^3 - \frac{3}{5}a^2 + \frac{4}{5}a$

3. $\frac{2}{m^2} + 3m - 12$

4. $27 + 3xy^3 - 12x^2y^2 - 10y$

Find $p(-2)$ and $p(3)$ for each function.

5. $p(x) = x^3 - x^5$

6. $p(x) = -7x^2 + 5x + 9$

7. $p(x) = -x^5 + 4x^3$

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

9. $p(x) = x^4 + \frac{1}{2}x^3 - \frac{1}{2}x$

10. $p(x) = \frac{1}{3x^3} + \frac{2}{3x^2} + 3x$

If $p(x) = 3x^2 - 4$ and $r(x) = 2x^2 - 5x + 1$, find each value.

11. $p(8a)$

12. $r(a^2)$

13. $-5r(2a)$

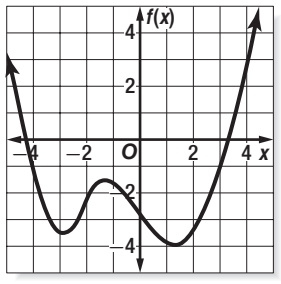
14. $r(x + 2)$

15. $p(x^2 - 1)$

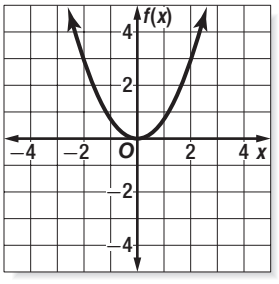
16. $5p(x + 2)]$

For each graph,
a. describe the end behavior,
b. determine whether it represents an odd-degree or an even-degree function, and
c. state the number of real zeroes.

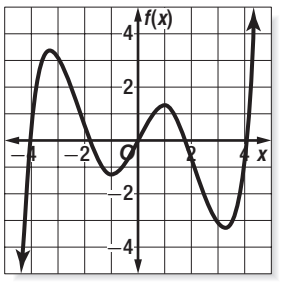
17.



18.



19.



20. WIND CHILL The function $C(w) = 0.013w^2 - w - 7$ estimates the wind chill temperature $C(w)$ at 0°F for wind speeds w from 5 to 30 miles per hour. Estimate the wind chill temperature at 0°F if the wind speed is 20 miles per hour.

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6-2 Skills Practice

Dividing Polynomials

Simplify.

1. $\frac{10c + 6}{2}$

2. $\frac{12x + 20}{4}$

3. $\frac{15y^3 + 6y^2 + 3y}{3y}$

4. $\frac{12x^2 - 4x - 8}{4x}$

5. $(15q^6 + 5q^2)(5q^4)^{-1}$

6. $(4f^5 - 6f^4 + 12f^3 - 8f^2)(4f^2)^{-1}$

7. $(6j^2k - 9jk^2) \div 3jk$

8. $(4a^2h^2 - 8a^3h + 3a^4) \div (2a^2)$

9. $(n^2 + 7n + 10) \div (n + 5)$

10. $(d^2 + 4d + 3) \div (d + 1)$

11. $(2t^2 + 13t + 15) \div (t + 5)$

12. $(6y^2 + y - 2)(2y - 1)^{-1}$

13. $(4g^2 - 9) \div (2g + 3)$

14. $(2x^2 - 5x - 4) \div (x - 3)$

15. $\frac{u^2 + 5u - 12}{u - 3}$

16. $\frac{2x^2 - 5x - 4}{x - 3}$

17. $(3v^2 - 7v - 10)(v - 4)^{-1}$

18. $(3t^4 + 4t^3 - 32t^2 - 5t - 20)(t + 4)^{-1}$

19. $\frac{y^3 - y^2 - 6}{y + 2}$

20. $\frac{2x^3 - x^2 - 19x + 15}{x - 3}$

21. $(4p^3 - 3p^2 + 2p) \div (p - 1)$

22. $(3c^4 + 6c^3 - 2c + 4)(c + 2)^{-1}$

23. GEOMETRY The area of a rectangle is $x^3 + 8x^2 + 13x - 12$ square units. The width of the rectangle is $x + 4$ units. What is the length of the rectangle?

NAME _____ DATE _____ PERIOD _____

6-2 Practice

Dividing Polynomials

Simplify.

1. $\frac{15r^{10} - 5r^8 + 40r^2}{5r^4}$

2. $\frac{6k^2m - 12k^3m^2 + 9m^3}{2km^2}$

3. $(-30x^3y + 12x^2y^2 - 18x^2y) \div (-6x^2y)$

4. $(-6w^3z^4 - 3w^2z^5 + 4w + 5z) \div (2w^2z)$

5. $(4a^3 - 8a^2 + a^2)(4a)^{-1}$

6. $(28d^3k^2 + d^2k^2 - 4dk^2)(4dk^2)^{-1}$

7. $\frac{f^2 + 7f + 10}{f + 2}$

8. $\frac{2x^3 + 3x - 14}{x - 2}$

9. $(a^3 - 64) \div (a - 4)$

10. $(b^3 + 27) \div (b + 3)$

11. $\frac{2x^3 + 6x + 152}{x + 4}$

12. $\frac{2x^3 + 4x - 6}{x + 3}$

13. $(3w^3 + 7w^2 - 4w + 3) \div (w + 3)$

14. $(6y^4 + 15y^3 - 28y - 6) \div (y + 2)$

15. $(x^4 - 3x^3 - 11x^2 + 3x + 10) \div (x - 5)$

16. $(3m^5 + m - 1) \div (m + 1)$

17. $(x^4 - 3x^3 + 5x - 6)(x + 2)^{-1}$

18. $(6y^2 - 5y - 15)(2y + 3)^{-1}$

19. $\frac{4x^2 - 2x + 6}{2x - 3}$

20. $\frac{6x^2 - x - 7}{3x + 1}$

21. $(2r^3 + 5r^2 - 2r - 15) \div (2r - 3)$

22. $(6t^3 + 5t^2 - 2t + 1) \div (3t + 1)$

23. $\frac{4p^4 - 17p^2 + 14p - 3}{2p - 3}$

24. $\frac{2h^4 - h^3 + h^2 + h - 3}{h^2 - 1}$

25. GEOMETRY The area of a rectangle is $2x^2 - 11x + 15$ square feet. The length of the rectangle is $2x - 5$ feet. What is the width of the rectangle?

26. GEOMETRY The area of a triangle is $15x^4 + 3x^3 + 4x^2 - x - 3$ square meters. The length of the base of the triangle is $6x^2 - 2$ meters. What is the height of the triangle?

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6-6 Skills Practice

The Remainder and Factor Theorems

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

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

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

3. $f(x) = x^2 - 2x - 2$

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

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

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

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

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

9. $f(x) = x^4 + 2x^2 - 9$

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

11. $f(x) = x^5 - 7x^3 - 4x + 10$

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

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

13. $x^3 + 2x^2 - x - 2;\ x + 1$

14. $x^3 + x^2 - 5x + 3;\ x - 1$

15. $x^3 + 3x^2 - 4x - 12;\ x + 3$

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

17. $x^3 + 2x^2 - 33x - 90;\ x + 5$

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

19. $x^3 - x^2 - 10x - 8;\ x + 2$

20. $x^3 - 19x + 30;\ x - 2$

21. $2x^3 + x^2 - 2x - 1;\ x + 1$

22. $2x^3 + x^2 - 5x + 2;\ x + 2$

23. $3x^3 + 4x^2 - 5x - 2;\ 3x + 1$

24. $3x^3 + x^2 + x - 2;\ 3x - 2$

NAME _____ DATE _____ PERIOD _____

6-6 Practice

The Remainder and Factor Theorems

Use synthetic substitution to find $f(-3)$ and $f(4)$ for each function.

1. $f(x) = x^2 + 2x + 3$

2. $f(x) = x^2 - 5x + 10$

3. $f(x) = x^2 - 5x - 4$

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

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

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

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

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

9. $f(x) = x^3 + 3x^2 + 2x - 50$

10. $f(x) = x^4 + x^3 - 3x^2 - x + 12$

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

12. $f(x) = 2x^4 - 3x^3 + 4x^2 - 2x + 1$

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

14. $f(x) = 3x^4 - 4x^3 + 3x^2 - 5x - 3$

15. $f(x) = x^5 + 7x^3 - 4x - 10$

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

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

17. $x^3 + 3x^2 - 6x - 8$; $x - 2$

18. $x^3 + 7x^2 + 7x - 15$; $x - 1$

19. $x^3 - 9x^2 + 27x - 27$; $x - 3$

20. $x^3 - x^2 - 8x + 12$; $x + 3$

21. $x^3 + 5x^2 - 2x - 24$; $x - 2$

22. $x^3 - x^2 - 14x + 24$; $x + 4$

23. $3x^3 - 4x^2 - 17x + 6$; $x + 2$

24. $4x^3 - 12x^2 - x + 3$; $x - 3$

25. $18x^3 + 9x^2 - 2x - 1$; $2x + 1$

26. $6x^3 + 5x^2 - 3x - 2$; $3x - 2$

27. $x^5 + x^4 - 5x^3 - 5x^2 + 4x + 4$; $x + 1$

28. $x^5 - 2x^4 + 4x^3 - 8x^2 - 5x + 10$; $x - 2$

29. POPULATION The projected population in thousands for a city over the next several years can be estimated by the function $P(x) = x^3 + 2x^2 - 8x + 520$, where x is the number of years since 2005. Use synthetic substitution to estimate the population for 2010.

30. VOLUME The volume of water in a rectangular swimming pool can be modeled by the polynomial $2x^3 - 9x^2 + 7x + 6$. If the depth of the pool is given by the polynomial $2x + 1$, what polynomials express the length and width of the pool?