Name: _____ **Class:** _____ **Date:** _____ **ID: X**

Alg 2 Topic 3 Practice

____ 1. Classify $-2x^4 - x^3 + 8x^2 + 12$ by degree.

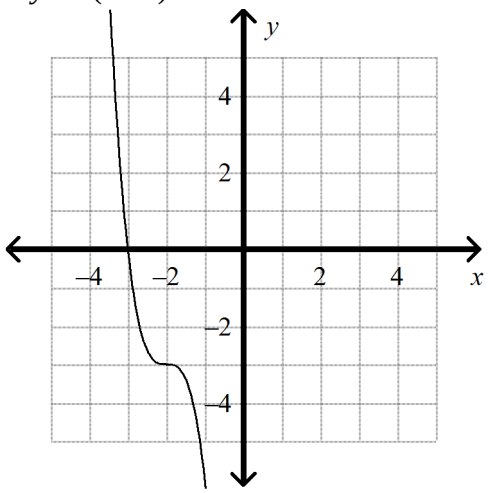
a. quartic
b. quintic
c. quadratic
d. cubic

____ 2. Classify $8x^4 + 7x^3 + 5x^2 + 8$ by number of terms.

a. trinomial
b. binomial
c. polynomial of 5 terms
d. polynomial of 4 terms

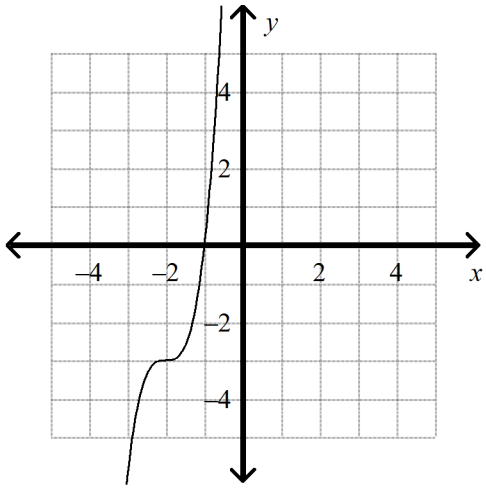
____ 3. Graph $y = 3(x+2)^3 - 3$ and describe the end behavior.

a.



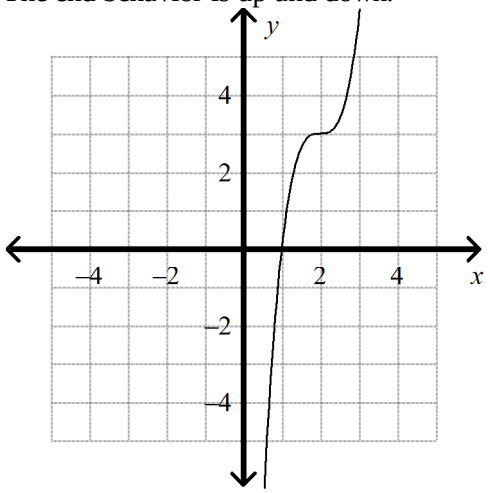
The end behavior is up and down.

c.



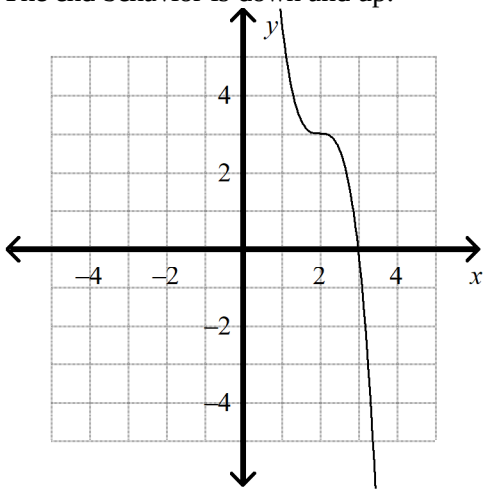
The end behavior is down and up.

b.



The end behavior is down and up.

d.



The end behavior is up and down.

Write the polynomial in standard form. Then name the polynomial based on its degree and number of terms.

____ 4. $4g - 5g^3 + 9g^2 - 6$

a. $5g^3 - 9g^2 + 4g - 6$; cubic trinomial
b. $9g^3 - 5g^2 + 4g - 6$; quadratic binomial
c. $-5g^3 + 9g^2 + 4g - 6$; cubic polynomial
d. $-6 + 4g + 9g^2 - 5g^3$; cubic binomial

What is the relative maximum and minimum of the function?

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

a. The relative maximum is at (4, 28) and the relative minimum is at (–2, –80).
b. The relative maximum is at (–4, 80) and the relative minimum is at (2, –28).
c. The relative maximum is at (4, 80) and the relative minimum is at (–2, –28).
d. The relative maximum is at (–4, 28) and the relative minimum is at (2, –80).

Consider the leading term of each polynomial function. What is the end behavior of the graph?

____ 6. $5x^8 - 2x^7 - 8x^6 + 1$

a. The leading term is $5x^8$. Since *n* is even and *a* is positive, the end behavior is down and up.
b. The leading term is $5x^8$. Since *n* is even and *a* is positive, the end behavior is up and down.
c. The leading term is $5x^8$. Since *n* is even and *a* is positive, the end behavior is up and up.
d. The leading term is $5x^8$. Since *n* is even and *a* is positive, the end behavior is down and down.

Simplify the sum.

____ 7. $(2u^3 + 6u^2 + 3) + (2u^3 - 7u + 6)$

a. $9 - 7u + 6u^2 + 4u^3$
b. $0u^3 + 6u^2 - 7u + 9$
c. $0u^3 - 7u^2 + 6u - 9$
d. $4u^3 + 6u^2 - 7u + 9$

Simplify the difference.

____ 8. $(4w^2 - 7w - 6) - (8w^2 + 2w - 3)$

a. $-4w^2 - 9w - 3$
b. $12w^2 + 9w + 3$
c. $-4w^2 - 5w - 9$
d. $12w^2 - 5w - 9$

Simplify the product.

____ 9. $8p(-3p^2 + 6p - 2)$

a. $-5p^3 + 14p^2 - 6p$
c. $14p^2 - 6p - 5p^3$
b. $48p^2 - 16p - 24p^3$
d. $-24p^3 + 48p^2 - 16p$

Multiply the polynomials.

____ 10. $(3x - 7)(3x - 5)$

a. $9x^2 + 6x + 35$
c. $9x^2 - 36x - 35$
b. $9x^2 + 36x + 35$
d. $9x^2 - 36x + 35$

Factor the polynomial.

____ 11. $25w^6 + 35w^3$

a. $5w^2(5w^4 + 7w)$
c. $w^3(25w^3 + 35)$
b. $5w^3(5w^3 + 7)$
d. $5(5w^6 + 7w^3)$

Use polynomial identities to multiply the expressions.

____ 12. $(2x - 6)^2$

a. $4x^2 - 24x + 36$
c. $4x^2 + 36$
b. $4x^2 - 8x + 36$
d. $4x^2 - 12x + 36$

What is a simpler form of the following expressions?

____ 13. $(7m^2 - 5)(7m^2 + 5)$

a. $49m^4 - 25$
c. $49m^2 - 25$
b. $49m^3 - 25$
d. $49m^4 + 25$

Use the Binomial Theorem to expand the binomial.

____ 14. $(d - 3b)^3$

a. $d^3 - 3d^2b + 3db^2 - b^3$
b. $d^3 + 3d^2b + 3db^2 + b^3$
c. $d^3 + 9d^2b + 27db^2 + 27b^3$
d. $d^3 - 9d^2b + 27db^2 - 27b^3$

Use Pascal's Triangle to expand the binomial.

____ 15. $(2v + s)^5$

a. $s^5 + 10s^4v + 40s^3v^2 + 80s^2v^3 + 80sv^4 + 32v^5$
b. $s^5 + 20s^4v + 80s^3v^2 + 160s^2v^3 + 160sv^4 + 64v^5$
c. $s^5 - 5s^4v + 10s^3v^2 - 10s^2v^3 + 5sv^4 - v^5$
d. $s^5 + 10s^4 + 40s^3 + 80s^2 + 80s + 32$

____ 16. Divide $4x^3 + 2x^2 + 3x + 4$ by $x + 4$ using long division.

a. $4x^2 - 14x + 59$
c. $4x^2 - 14x + 59$, R –232
b. $4x^2 + 18x - 53$, R 240
d. $4x^2 + 18x - 53$

Divide using synthetic division.

____ 17. Divide $-4x^3 + 21x^2 - 23x + 6$ by $(x - 4)$.

a. $-4x^2 + 5x - 3$, R –6
c. $-4x^2 + 37x - 43$, R 18
b. $4x^2 - 5x + 3$
d. $4x^2 - 37x + 43$

____ 18. Use synthetic division to find $P(-2)$ for $P(x) = x^4 + 9x^3 - 9x + 2$.

a. –2
b. 0
c. –36
d. 68

What are all the real and complex solutions of the polynomial equation?

____ 19. $x^3 - 8 = 0$

a. $1 + i\sqrt{3}$ and $1 - i\sqrt{3}$
c. 2, $1 + 2i\sqrt{3}$, and $1 - 2i\sqrt{3}$
b. 2, $-1 + i\sqrt{3}$, and $-1 - i\sqrt{3}$
d. 2, $2 + 2i\sqrt{3}$, and $2 - 2i\sqrt{3}$

What are the zeros of the function? What are their multiplicities?

____ 20. $f(x) = x^4 - 4x^3 + 3x^2$

a. the numbers –1 and –3 are zeros of multiplicity 2; the number 0 is a zero of multiplicity 1
b. the number 0 is a zero of multiplicity 2; the numbers 1 and 3 are zeros of multiplicity 1
c. the numbers 0 and 1 are zeros of multiplicity 2; the number 3 is a zero of multiplicity 1
d. the number 0 is a zero of multiplicity 2; the numbers –1 and –3 are zeros of multiplicity 1

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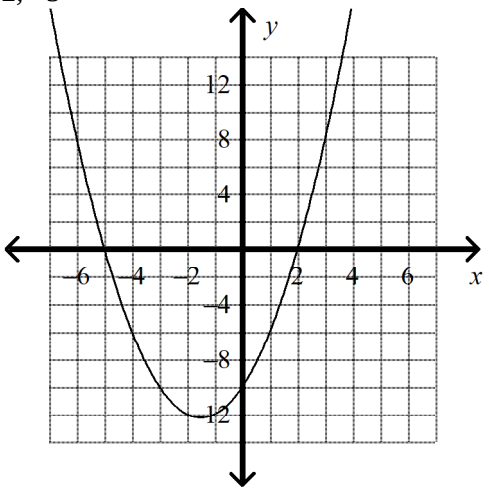
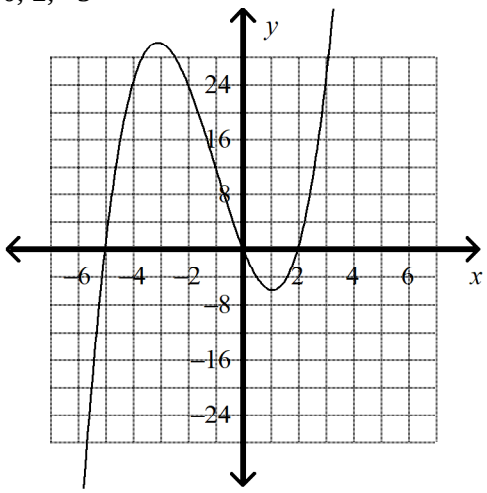
What are the zeros of the function? Graph the function.

____ 21. $y = x(x - 2)(x + 5)$

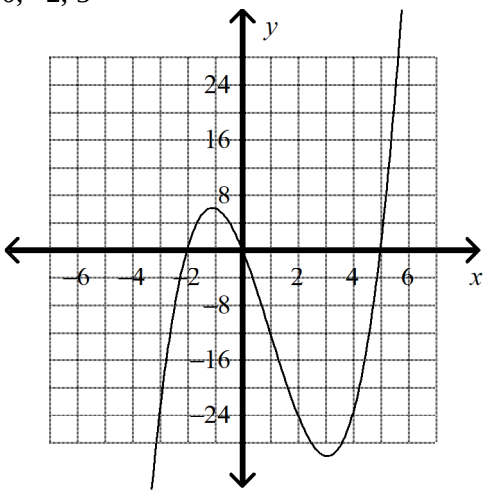
a. 2, –5



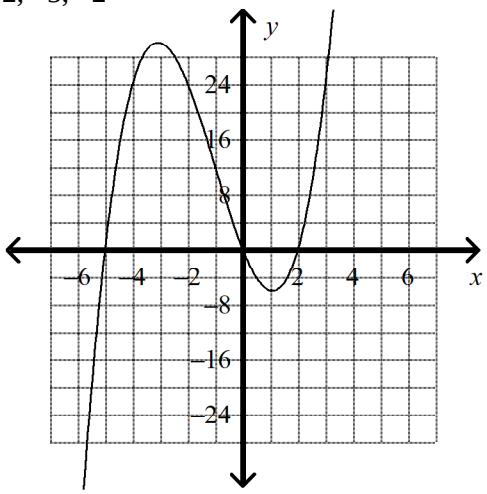
c. 0, 2, –5



b. 0, –2, 5



d. 2, –5, –2



____ 22. What values of x are solutions to the inequality $4x^3 - 10x^2 - 6x > 0$? Use a graph to solve.

a. $-\frac{1}{2} < x$ and $x > 3$

b. $-\frac{1}{2} < x < 0$ and $x > 3$

c. $x > \frac{1}{2}$ and $-3 < x < 0$

d. $x < -\frac{1}{2}$ and $0 < x < 3$

Find all the zeros of the equation.

____ 23. $-x^3 + x^2 - 3x + 3 = 0$

a. $\sqrt{3}, -\sqrt{3}, 1$

b. $i\sqrt{3}, -1$

c. $i\sqrt{3}, -i\sqrt{3}, -1$

d. $i\sqrt{3}, -i\sqrt{3}, 1$

____ 24. Use the Rational Root Theorem to list all possible rational roots of the polynomial equation $x^3 - 4x^2 + 7x - 8 = 0$. Do not find the actual roots.

a. –8, –1, 1, 8
b. –8, –4, –2, –1, 1, 2, 4, 8
c. 1, 2, 4, 8
d. no possible roots

Find the roots of the polynomial equation.

____ 25. $-x^3 + 5x^2 - 11x + 55 = 0$

a. $i\sqrt{11}, -i\sqrt{11}, -5$
b. $\sqrt{11}, -\sqrt{11}, 5$
c. $i\sqrt{11}, -5$
d. $i\sqrt{11}, -i\sqrt{11}, 5$

____ 26. A cubic polynomial with rational coefficients has the roots $2 + \sqrt{7}$ and $\frac{3}{8}$. Find one additional root.

a. $2 + \sqrt{7}$
b. $2 - \sqrt{7}$
c. $7 - \sqrt{2}$
d. $7 + \sqrt{2}$

____ 27. Are the polynomial functions given below even, odd, or neither?

Function I **Function II**

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

a. Function I: neither
Function II: odd
b. Function I: odd
Function II: even
c. Function I: even
Function II: odd
d. Function I: neither
Function II: even

____ 28. How does the graph of the function $f(x) = (x - 15)^3 + 4$ differ from the graph of its parent cubic function?

a. The graph has been translated left 4 units and down 15 units.
b. The graph has been translated right 4 units and down 15 units.
c. The graph has been translated right 15 units and up 4 units.
d. The graph has been translated left 15 units and up 4 units.

What is the equation of $y = x^3$ with the given transformations?

____ 29. vertical stretch by a factor of 8, horizontal shift 2 units to the right, vertical shift 7 units down

a. $y = 8(x + 2)^3 - 7$
b. $y = 8(x - 2)^3 - 7$
c. $y = 8(x - 2)^3 + 7$
d. $y = \frac{1}{8}(x - 2)^3 - 7$

____ 30. What are all the real zeros of $y = (x - 12)^3 - 10$?

a. $x = \sqrt[3]{10 + 12}$
b. $x = \sqrt[3]{-10} + 12$
c. $x = \sqrt[3]{10} + 12$
d. $x = \sqrt[3]{12} - 10$

Alg 2 Topic 3 Practice
Answer Section

1. ANS: A PTS: 1 DIF: L2 REF: 3-1 Graphing Polynomial Functions
   OBJ: 3-1.1 Graph polynomial functions and show the key features of the graph.
   NAT: HSA.SSE.A.1.a| HSF.IF.B.4| HSF.IF.C.7| HSF.IF.C.7.c
   TOP: 3-1 Example 1 Classify Polynomials
   KEY: degree of a polynomial | polynomial function | standard form of a polynomial function
2. ANS: D PTS: 1 DIF: L2 REF: 3-1 Graphing Polynomial Functions
   OBJ: 3-1.1 Graph polynomial functions and show the key features of the graph.
   NAT: HSA.SSE.A.1.a| HSF.IF.B.4| HSF.IF.C.7| HSF.IF.C.7.c
   TOP: 3-1 Example 1 Classify Polynomials
   KEY: degree of a polynomial | polynomial function | standard form of a polynomial function
3. ANS: C PTS: 1 DIF: L4 REF: 3-1 Graphing Polynomial Functions
   OBJ: 3-1.1 Graph polynomial functions and show the key features of the graph.
   NAT: HSA.SSE.A.1.a| HSF.IF.B.4| HSF.IF.C.7| HSF.IF.C.7.c
   TOP: 3-1 Example 3 Graph a Polynomial Function
   KEY: polynomial function | end behavior | turning point
4. ANS: C PTS: 1 DIF: L3 REF: 3-1 Graphing Polynomial Functions
   OBJ: 3-1.1 Graph polynomial functions and show the key features of the graph.
   NAT: HSA.APR.A.1 TOP: 3-1 Example 1 Classify Polynomials
   KEY: monomial | degree of a monomial | polynomial | degree of a polynomial | standard form of a polynomial | trinomial
5. ANS: B PTS: 1 DIF: L3 REF: 3-1 Graphing Polynomial Functions
   OBJ: 3-1.1 Graph polynomial functions and show the key features of the graph.
   NAT: HSA.SSE.A.1| HSA.APR.B.3| HSF.IF.C.7| HSF.IF.C.7.c| HSF.BF.A.1
   TOP: 3-1 Example 3 Graph a Polynomial Function
   KEY: relative maximum | relative minimum
6. ANS: C PTS: 1 DIF: L2 REF: 3-1 Graphing Polynomial Functions
   OBJ: 3-1.2 Predict the end behavior of polynomial functions by interpreting the leading coefficients and degrees. NAT: HSA.SSE.A.1.a| HSF.IF.B.4| HSF.IF.C.7| HSF.IF.C.7.c
   TOP: 3-1 Example 2 Understand End Behavior of Polynomial Functions
   KEY: polynomial | end behavior | turning point
7. ANS: D PTS: 1 DIF: L3
   REF: 3-2 Adding, Subtracting, and Multiplying Polynomials
   OBJ: 3-2.1 Add, subtract, and multiply polynomials and understand that polynomials are closed under these operations. NAT: HSA.APR.A.1
   TOP: 3-2 Example 1 Add and Subtract Polynomials
   KEY: polynomial | standard form of a polynomial | trinomial
8. ANS: A PTS: 1 DIF: L3
   REF: 3-2 Adding, Subtracting, and Multiplying Polynomials
   OBJ: 3-2.1 Add, subtract, and multiply polynomials and understand that polynomials are closed under these operations. NAT: HSA.APR.A.1
   TOP: 3-2 Example 1 Add and Subtract Polynomials
   KEY: polynomial | standard form of a polynomial | trinomial

9. ANS: D PTS: 1 DIF: L3
REF: 3-2 Adding, Subtracting, and Multiplying Polynomials
OBJ: 3-2.1 Add, subtract, and multiply polynomials and understand that polynomials are closed under these operations. NAT: HSA.APR.A.1
TOP: 3-2 Example 2 Multiply Polynomials
10. ANS: D PTS: 1 DIF: L3
REF: 3-2 Adding, Subtracting, and Multiplying Polynomials
OBJ: 3-2.1 Add, subtract, and multiply polynomials and understand that polynomials are closed under these operations. NAT: HSA.APR.A.1
TOP: 3-2 Example 2 Multiply Polynomials KEY: multiplying binomials
11. ANS: B PTS: 1 DIF: L3 REF: 3-3 Polynomial Identities
OBJ: 3-3.1 Prove polynomial identities and use them to multiply and factor polynomials.
NAT: HSA.APR.A.1
TOP: 3-3 Example 3 Use Polynomial Identities to Factor and Simplify
12. ANS: A PTS: 1 DIF: L2 REF: 3-3 Polynomial Identities
OBJ: 3-3.1 Prove polynomial identities and use them to multiply and factor polynomials.
NAT: HSA.APR.A.1 TOP: 3-3 Example 2 Use Polynomial Identities to Multiply
13. ANS: A PTS: 1 DIF: L4 REF: 3-3 Polynomial Identities
OBJ: 3-3.1 Prove polynomial identities and use them to multiply and factor polynomials.
NAT: HSA.APR.A.1 TOP: 3-3 Example 2 Use Polynomial Identities to Multiply
14. ANS: D PTS: 1 DIF: L3 REF: 3-3 Polynomial Identities
OBJ: 3-3.2 Expand binomials using the Binomial Theorem and coefficients determined by Pascal's Triangle.
NAT: HSA.APR.C.5
TOP: 3-3 Example 5 Apply the Binomial Theorem KEY: Binomial Theorem | expand
15. ANS: A PTS: 1 DIF: L3 REF: 3-3 Polynomial Identities
OBJ: 3-3.2 Expand binomials using the Binomial Theorem and coefficients determined by Pascal's Triangle.
NAT: HSA.APR.C.5
TOP: 3-3 Example 4 Expand a Power of a Binomial KEY: Pascal's Triangle | expand
16. ANS: C PTS: 1 DIF: L2 REF: 3-4 Dividing Polynomials
OBJ: 3-4.1 Divide polynomial expressions using long division.
NAT: HSA.APR.A.1| HSA.APR.B.2| HSA.APR.D.6
TOP: 3-4 Example 1 Use Long Division to Divide Polynomials
17. ANS: A PTS: 1 DIF: L3 REF: 3-4 Dividing Polynomials
OBJ: 3-4.2 Use synthetic division to rewrite rational expressions.
NAT: HSA.APR.A.1| HSA.APR.B.2| HSA.APR.D.6
TOP: 3-4 Example 2 Use Synthetic Division to Divide by x - a KEY: synthetic division
18. ANS: C PTS: 1 DIF: L3 REF: 3-4 Dividing Polynomials
OBJ: 3-4.2 Use synthetic division to rewrite rational expressions.
NAT: HSA.APR.A.1| HSA.APR.B.2| HSA.APR.D.6
TOP: 3-4 Example 4 Use the Remainder Theorem to Evaluate Polynomials
KEY: synthetic division | remainder theorem
19. ANS: B PTS: 1 DIF: L2 REF: 3-5 Zeros of Polynomial Functions
OBJ: 3-5.1 Identify the zeros of a function by factoring or using synthetic division.
NAT: HSA.SSE.A.2| HSA.REI.A.11 TOP: 3-5 Example 3 Find Real and Complex Zeros
KEY: sum of cubes | difference of cubes

20. ANS: B PTS: 1 DIF: L3 REF: 3-5 Zeros of Polynomial Functions
OBJ: 3-5.1 Identify the zeros of a function by factoring or using synthetic division.
NAT: HSA.SSE.A.1| HSA.APR.B.3| HSF.IF.C.7| HSF.IF.C.7.c| HSF.BF.A.1
TOP: 3-5 Example 3 Find Real and Complex Zeros KEY: multiple zero | multiplicity

21. ANS: C PTS: 1 DIF: L3 REF: 3-5 Zeros of Polynomial Functions
OBJ: 3-5.2 Use the zeros of a polynomial function to sketch its graph.
NAT: HSA.SSE.A.1| HSA.APR.B.3| HSF.IF.C.7| HSF.IF.C.7.c| HSF.BF.A.1
TOP: 3-5 Example 1 Use Zeros to Graph a Polynomial Function

22. ANS: B PTS: 1 DIF: L3 REF: 3-5 Zeros of Polynomial Functions
OBJ: 3-5.2 Use the zeros of a polynomial function to sketch its graph.
NAT: HSA.SSE.A.2| HSA.APR.B.3| HSF.IF.C.7.C
TOP: 3-5 Example 6 Solve a Polynomial Inequality by Graphing
KEY: polynomial inequality

23. ANS: D PTS: 1 DIF: L2
REF: 3-6 Theorems About Roots of Polynomial Equations
OBJ: 3-6.1 Extend polynomial theorems and identities to find the real and complex solutions of polynomial equations. NAT: HSN.CN.C.7| HSN.CN.C.8| HSN.CN.C.9| HSA.APR.B.3
TOP: 3-6 Example 3 Find All Complex Roots KEY: Rational Root Theorem

24. ANS: B PTS: 1 DIF: L2
REF: 3-6 Theorems About Roots of Polynomial Equations
OBJ: 3-6.1 Extend polynomial theorems and identities to find the real and complex solutions of polynomial equations. NAT: HSN.CN.C.7| HSN.CN.C.8
TOP: 3-6 Example 2 Use the Rational Root Theorem KEY: Rational Root Theorem

25. ANS: D PTS: 1 DIF: L3
REF: 3-6 Theorems About Roots of Polynomial Equations
OBJ: 3-6.1 Extend polynomial theorems and identities to find the real and complex solutions of polynomial equations. NAT: HSN.CN.C.7| HSN.CN.C.8
TOP: 3-6 Example 3 Find All Complex Roots KEY: Rational Root Theorem

26. ANS: B PTS: 1 DIF: L3
REF: 3-6 Theorems About Roots of Polynomial Equations
OBJ: 3-6.2 Write polynomial functions using conjugates. NAT: HSN.CN.C.7| HSN.CN.C.8
TOP: 3-6 Example 5 Write Polynomial Functions Using Conjugates
KEY: Conjugate Root Theorem

27. ANS: D PTS: 1 DIF: L2
REF: 3-7 Transformations of Polynomial Functions
OBJ: 3-7.1 Recognize even and odd functions from their graphs and algebraic equations.
NAT: HSF.BF.B.3 TOP: 3-7 Example 2 Identify Even and Odd Functions From Their Equations
KEY: even functions | odd functions

28. ANS: C PTS: 1 DIF: L3
REF: 3-7 Transformations of Polynomial Functions
OBJ: 3-7.2 Identify the effect on the graphs of cubic and quartic functions of replacing f(x) with f(x) + k, kf(x), f(kx) and f(x + k). NAT: HSF.BF.B.3
TOP: 3-7 Example 5 Apply a Transformation of a Cubic Function
KEY: transformations | cubic functions

29. ANS: B PTS: 1 DIF: L3
REF: 3-7 Transformations of Polynomial Functions
OBJ: 3-7.2 Identify the effect on the graphs of cubic and quartic functions of replacing f(x) with f(x) + k, kf(x), f(kx) and f(x + k). NAT: HSF.IF.C.7.c| HSF.IF.C.8| HSF.IF.C.9| HSF.BF.B.3
TOP: 3-7 Example 4 Identify a Transformation

30. ANS: C PTS: 1 DIF: L3
REF: 3-7 Transformations of Polynomial Functions
OBJ: 3-7.2 Identify the effect on the graphs of cubic and quartic functions of replacing f(x) with f(x) + k, kf(x), f(kx) and f(x + k). NAT: HSF.IF.C.7.c| HSF.IF.C.8| HSF.IF.C.9| HSF.BF.B.3
TOP: 3-7 Example 3 Graph Transformations of Cubic and Quartic Parent Functions