Name _____ Period _____Date _____

Practice 6-1 Polynomial Functions

Write each polynomial in standard form. Then classify it by degree and by number of terms.

1. $(2x + 1)^2$ **2.** $(2x^2 - 4x + 7) - (-x^2 - 13)$ **3.** $6x^4 - 1$

4. $(x^4 - 5)^2$ **5.** $5m^2 - 3m^2$ **6.** $x^2 + 3x - 4x^3$

7. Find a cubic function to model the data below. (Hint: Use the number of years past 1940 for x.) Then use the function to estimate the average monthly Social Security Benefit for a retired worker in 2010.

Average Monthly Social Security Benefits, 1940–2003

Year	1940	1950	1960	1970	1980	1990	2000	2003
Amount (in dollars)	22.71	29.03	81.73	123.82	321.10	550.50	844.60	922.10

Practice 6-2 Polynomials and Linear Factors

For each function, determine the zeros. State the multiplicity, describe the end behavior and sketch.

1. $y = (x - 5)^3$ **2.** $y = x(x - 8)^2$

3. $f(x) = x^4 - 8x^3 + 16x^2$ **4.** $f(x) = 9x^3 - 81x$

Write a polynomial function in standard form with the given zeros.

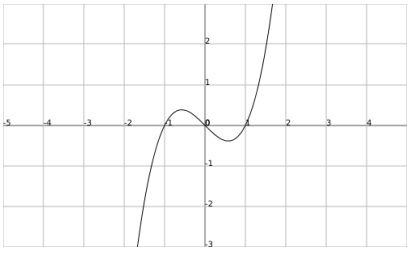
5. –1, 3, 4 **6.** 1, 1, 2 **7.** –3, 0, 0, 5 **8.** –2 multiplicity 3

Find the zeros, multiplicity and end behavior of each function. Then sketch the graph.

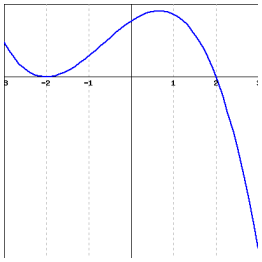
9. $y = 2x^3 + 10x^2 + 12x$ **10.** $y = x^4 - x^3 - 6x^2$ **11.** $y = -3x^3 + 18x^2 - 27x$

Find a polynomial, in standard form, which represents each graph below.

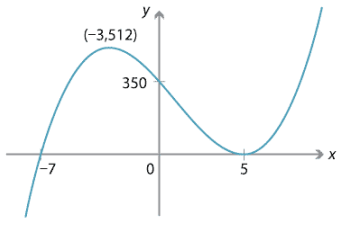
12.



13.



14.



Practice 6-3 — Dividing Polynomials

Determine whether each binomial is a factor of $x^3 + 3x^2 - 10x - 24$.

1. $x + 4$ **2.** $x - 3$

Divide using long division.

3. $(2x^2 + x - 7) \div (x - 5)$ **4.** $(x^3 + 5x^2 - 3x - 1) \div (x - 1)$ **5.** $(3x^3 - x^2 - 7x + 6) \div (x + 2)$

Divide using synthetic division.

6. $(x^3 - 8x^2 + 17x - 10) \div (x - 5)$ **7.** $(x^3 + 5x^2 - x - 9) \div (x + 2)$

Use synthetic division and the Remainder Theorem to find $P(a)$.

8. $P(x) = 3x^3 - 4x^2 - 5x + 1$; $a = 2$ **9.** $P(x) = x^3 + 6x^2 + 10x + 3$; $a = -3$

Use synthetic division and the given factor to completely factor each polynomial function.

10. $y = x^3 + 3x^2 - 13x - 15$; $(x + 5)$ **11.** $y = x^3 - 3x^2 - 10x + 24$; $(x - 2)$

Divide.

12. $(6x^3 + 2x^2 - 11x + 12) \div (3x + 4)$ **13.** $(x^4 + 2x^3 + x - 3) \div (x - 1)$

14. $(x^4 - 3x^2 - 10) \div (x - 2)$

15. A box is to be mailed. The volume in cubic inches of the box can be expressed as the product of its three dimensions: $V(x) = x^3 - 16x^2 + 79x - 120$. The length is $x - 8$. Find linear expressions for the other dimensions. Assume that the width is greater than the height.

Practice 6-4 — Solving Polynomial Equations

Factor the expression on the left side of each equation. Then solve the equation.

1. $8x^3 - 27 = 0$

2. $x^3 + 64 = 0$

3. $x^4 - 5x^2 + 4 = 0$

4. $x^4 - 10x^2 + 16 = 0$

5. $x^4 - 81 = 0$

6. $x^3 + 4x^2 + 7x + 28 = 0$

Use a graphing calculator to find the zeros. For the cubic polynomials, find the relative maximum and the relative minimum. Where necessary, round to the nearest hundredth.

7. $x^3 + 5x^2 - 2x - 15 = 0$

8. $12x^4 + 14x^3 - 5x^2 - 14x - 4 = 0$

9. $4x^3 + 16x^2 - 22x - 10 = 0$

Practice 6-5 — Theorems About Roots of Polynomial Equations

A polynomial equation with rational coefficients has the given roots. Find two additional roots.

1. $2 + 3i$ and $\sqrt{7}$

2. $3 - \sqrt{2}$ and $1 + \sqrt{3}$

3. $-4i$ and $6 - i$

4. $5 - \sqrt{6}$ and $-2 + \sqrt{10}$

Use the Rational Root Theorem to list all possible rational roots for each polynomial equation. Then find any actual rational roots. Verify your roots using synthetic division.

5. $2x^4 = 9x^2 - 4$

6. $x^3 - 5x^2 + 2x + 8 = 0$

7. $2x^3 + 13x^2 + 17x - 12 = 0$

8. $6x^3 + 10x^2 + 5x = 0$

Find a third-degree polynomial equation with rational coefficients that has the given numbers as roots.

9. $5, 2i$

10. $-7, i$

Practice 6-6 — The Fundamental Theorem of Algebra

Find all the zeros (real and imaginary) of each function.

1. $y = -4x^3 + 100x$

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

3. $f(x) = x^4 + 6x^3 + 13x^2 + 12x + 4$

4. $f(x) = x^3 - 9x^2 + 27x - 27$