Secondary 3 Honors Name_____

Practice 2.1: Polynomial Operations & Factoring

Period____

Factor each completely.

1) $r^2 - 49$
2) $25n^2 - 81$
3) $4x^2 - 1$
4) $64v^2 - 9$
5) $x^2 - y^2$
6) $x^2 - 16y^2$
7) $4m^2 + 20m + 16$
8) $k^2 - 2k - 15$
9) $3n^2 + 7n - 40$
10) $5p^2 + 42p - 27$
11) $5n^2 - 39n + 54$
12) $5p^2 - 32p + 12$

Simplify each expression.

13) $(6n^3 + 7n - 5n^2) - (7n^3 + 3n^2)$
14) $(8k^2 - k^3 + 5k^4) - (2k^2 + 8k^3)$
15) $(7v^3 + v^4 - 3) + (6 + 7v^4)$
16) $(8x^2 - 5x^3 + 4x) + (6x^3 + 3x^2)$
17) $(8x - 3)(3x + 7)$
18) $(3m + 2)(6m + 1)$
19) $(5x^2 + 5x - 7)(6x - 3)$
20) $(5r^2 - 7r + 7)(8r + 3)$
21) $(49x^2 - 28x - 60) \div (7x + 6)$
22) $(27m^2 - 21m - 20) \div (3m - 4)$
23) $(2n^2 - 8n - 90) \div (2n + 10)$
24) $(30n^2 + 23n + 2) \div (3n + 2)$
25) $\dfrac{2x - 1}{2x^2 - 7x + 3}$
26) $\dfrac{3x + 24}{x^2 + 12x + 32}$

Secondary 3 Honors Name_____

2-2 Practice: Factoring and Long Division

Period____

Factor each completely.

1) $x^2 - y^2$
2) $x^2 - 16y^2$
3) $1 + 27x^3$
4) $-27u^3 + 8$
5) $64 - 27m^3$
6) $8x^3 - 1$
7) $24n^2 + 192n$
8) $8x^3 - 17x^2 + 2x$
9) $6x^3 - 41x^2 - 56x$
10) $10x^2 + 41x - 18$
11) $4b^3 + 21b^2 + 27b$
12) $9m^2 + 46m + 40$
13) $56r^3 - 32r^2 + 35r - 20$
14) $36b^3 + 27b^2 + 24b + 18$
15) $21a^3 - 12a^2 - 35a + 20$
16) $9p^3 - 21p^2 - 15p + 35$
17) $72n^3 + 84n^2 - 60n - 70$
18) $8p^3 - 16p^2 - p + 2$

Divide the two functions using Long Division and write a summary statement in fraction form.

19) $(4b^3 + 16b^2 + 24b) \div 8b^2$
20) $(12n^5 + 4n^4 + n^3) \div 4n^2$
21) $(2k^3 + 15k^2 - 16k - 63) \div (k + 8)$
22) $(x^3 + 7x^2 - 39x - 83) \div (x + 10)$

Name: _____ Period: _____

2-3 Practice: Real Zeros with Long and Synthetic Division

Divide $f(x)$ by $d(x)$ using long division and write a summary statement in fraction form.

1. $f(x) = x^3 - 1 \qquad d(x) = x + 1$
2. $f(x) = x^3 + 4x^2 + 7x - 9$
   $d(x) = x + 3$

Divide using synthetic division. Write a summary statement using fraction form.

3. $\frac{x^3-5x^2+3x-2}{x+1}$
4. $\frac{2x^4-5x^3+7x^2-3x+1}{x-3}$
5. $\frac{9x^3+7x^2-3x}{x-10}$
6. $\frac{3x^4+x^3-4x^2+9x-3}{x+5}$

Use the Remainder Theorem to find the remainder when $f(x)$ is divided by $x - k$.

7. $f(x) = x^3 - x^2 + 2x - 1 \quad k = -3$
8. $f(x) = x^3 - 3x + 4 \quad k = -2$
9. $f(x) = 2x^3 - 3x^2 + 4x - 7 \quad k = 2$

Use Rational Roots Theorem to write a list of all possible rational zeros. Then determine which ones, if any, are zeros.

10. $f(x) = 6x^3 - 5x - 1$
11. $f(x) = 2x^3 - x^2 - 9x + 9$

Find all of the real zeros of the function, finding exact values whenever possible. Identify each zero as rational or irrational.

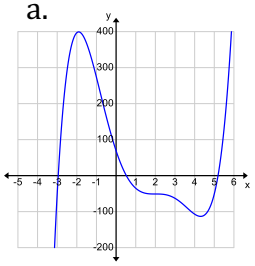
12. $f(x) = x^3 + 3x^2 - 3x - 9$

Name: _____ Period: _____

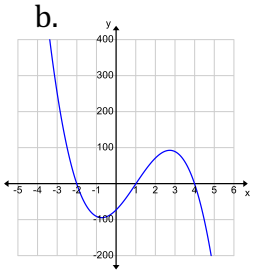
2-4 Practice: Polynomial Functions of Higher Degree

Match the polynomial function with its graph. Explain your choice. Do not use a graphing calculator.

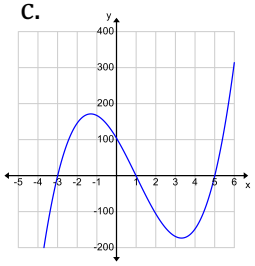
a.



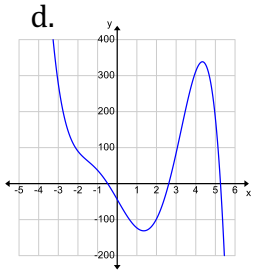
b.



c.



d.



1. $f(x) = 7x^3 - 21x^2 - 91x + 104$
2. $f(x) = -9x^3 + 27x^2 + 54x - 73$
3. $f(x) = x^5 - 8x^4 + 9x^3 + 58x^2 - 164x + 69$
4. $f(x) = -x^5 + 3x^4 + 16x^3 - 2x^2 - 95x - 44$

Graph the function in a viewing window that shows all of its extrema and x-intercepts. Describe the end behavior using limits.

5. $f(x) = (x - 1)(x + 2)(x + 3)$
6. $f(x) = -x^3 + 4x^2 + 31x - 70$
7. $f(x) = 2x^4 - 5x^3 - 17x^2 + 14x + 41$

Find the zeros of the function algebraically.

8. $f(x) = x^2 + 2x - 8$
9. $f(x) = x^3 - 25x$
10. $f(x) = 3x^3 - x^2 - 2x$

State the degree and list the zeros of the polynomial function. State the multiplicity of each zero and whether the graph crosses the x-axis at the corresponding x-intercept. Then sketch the graph by hand.

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

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

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

14. $f(x) = 7(x - 3)^2(x + 5)^4$

Using only algebra, find a cubic function with the given zeros.

15. $3, -4, 6$

16. $\sqrt{3}, -\sqrt{3}, 4$

Name: _____ Period: _____

2-5 HW: Graphing Polynomials

State the degree and list the zeros of the polynomial function. State the multiplicity of each zero and whether the graph crosses the x-axis at the corresponding x-intercept. Then sketch the graph by hand.

1. $f(x) = x^2(x + 7)$
2. $f(x) = (x - 4)^5(x + 1)^2$
3. $f(x) = x^7(x - 9)^4$
4. $f(x) = 4(x - 3)^6(x + 8)^4$
5. $f(x) = x^3 + x^2 - x - 1$
6. $f(x) = x^4 + 5x^3 - 4x^2 - 44x - 48$
7. $f(x) = 9x^4 - 81x^2$
8. $f(x) = -x^4 + x^3 + 2x^2$

Using long division for either 9 or 10, and synthetic division for the other, divide $f(x)$ by $d(x)$ and write a summary statement in fraction form.

9. $f(v) = 7v^3 - 40v^2 + 27v - 2$
   $d(v) = v - 5$
10. $f(x) = 6x^3 - 62x^2 + 27x - 76$
    $d(x) = x - 10$

11. What are the second and third terms of the arithmetic sequence:

120, ____, ____, 96, . . . ?

12. Find the sum of the finite geometric series:

$$\sum_{n=1}^{15} 5\left(\frac{1}{2}\right)^n$$

Name: _____ Period: _____

2-6 HW: Complex Zeros and Fundamental Theorem of Algebra

Write the polynomial in standard form, and identify the zeros of the function and the x-intercepts of its graph.

1. $f(x) = (x - 3i)(x + 3i)$
2. $f(x) = (x - 1)(x - 1)(x + 2i)(x - 2i)$

Write a polynomial function of minimum degree in standard form with real coefficients whose zeros include those listed.

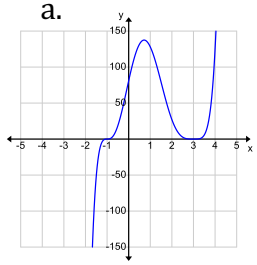
3. $i \; and \; -i$
4. $-4, 1 - i, 1 + i$
5. $2, 3, i$

Write a polynomial function of minimum degree in standard form with real coefficients whose zeros and their multiplicities include those listed.

6. $2 \; (mult: 2), 3 + i \; (mult: 1)$

Match the polynomial function graph to the given zeros and multiplicities.

a.



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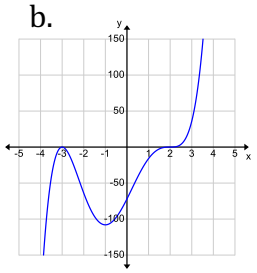
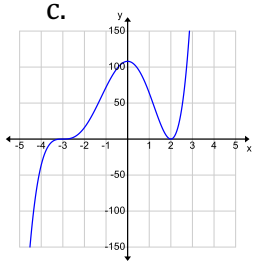
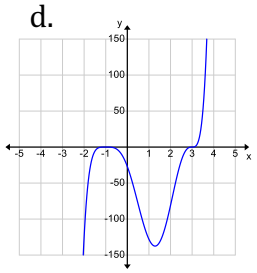


c.



d.



7. $-3 \; (mult: 2), 2 \; (mult: 3)$
8. $-3 \; (mult: 3), 2 \; (mult: 2)$
9. $-1 \; (mult: 4), 3 \; (mult: 3)$
10. $-1 \; (mult: 3), 3 \; (mult: 4)$

State how many complex zeros the function has and how many of them are real.

11. $f(x) = x^2 - 2x + 7$
12. $f(x) = x^3 - 7x^2 + 4x - 28$
13. $f(x) = x^5 + x^3 - 30x$
14. $f(x) = x^4 - 2x^2 + 3x - 4$

Find all of the zeros and write in factored form.

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

Divide using Long Division and write a summary statement in fraction form.

16. $f(x) = 8x^4 + 3x^2 + 5x - 14 \quad d(x) = x - 2$