Pre-Calculus Summer Assignment 2019

Your summer assignment is a review of the main concepts from Algebra 2. This assignment will be collected on the first day of school and will count as a 25 point homework grade. It will be graded on both completeness and accuracy. Show all of the steps in solving each problem. Do all of you work in the packet. You will have a test on this material the fourth day of school. Also, set up your binder for the first day of school.

Pre-Calculus Binder Requirement:

It is required that you get a large binder (at least 2 inches thick) with three sections with dividers. Fill up your binder with lined paper and graph paper.

Section 1 – Openers
Section 2 – Notes and homework
Section 3 – Vocabulary and formulas
Section 4 – Tests and Quizzes

In addition, you will need a zippered pouch with three holes that will hold your materials in your binder. Include the following tools:

1. At least 6 pencils
2. TI-84 calculator
3. Protractor
4. Ruler (cm and inches, could be small)
5. Colored Pencils

The problems in this packet will help you determine how well you understand the foundational concepts from Algebra 2. This is the minimum practice you will need. As you complete the packet, assess which problems you need more work on. You are responsible for all of the topics listed on the objective list. You should work extra examples and review the section in detail for any problems that you have difficulty with. Khan Academy is also a source you can use for extra help. Three school days are not enough time to re-learn all of that material. It is your responsibility to come to school the first day with only the questions you could not work out on your own.

I look forward to working with you next year!

Mrs. Jakobsen

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PreCalculus Summer Assignment Test Objectives

1. Factor a polynomial using greatest common factor, difference of two squares, perfect square trinomial, factorable trinomial, and grouping. (see review in this packet)
2. Write the equation of a line in point-slope and slope-intercept forms. *section 1.1*
3. Determine whether a relation is a function. *section 1.2* Apply the vertical line test. *section 1.3*
4. Apply function notation. *section 1.2*
5. Find the domain and range of functions. *sections 1.2, 1.3*
6. Determine intervals where a function is increasing, decreasing, or constant. *section 1.3*
7. Determine the relative maximum and minimum values of a function. *section 1.3*
8. Know the graphs of parent functions (except rational $y = \frac{1}{x}$). *section 1.4*
9. Apply transformations to graphs including shifts, stretches, and reflections. *section 1.4*
10. Find the composition of two functions. *section 1.5*
11. Determine two functions $f(x)$ and $g(x)$ that create a given composite function $h(x) = f(g(x))$. *section 1.5*
12. Apply the composite function test to determine if two functions are inverses. *section 1.6*
13. Determine whether functions are one-to-one. *section 1.6*
14. Find the inverse of a function numerically, graphically, and algebraically. *section 1.6*
15. Construct scatterplots and interpret correlation. *section 1.7*
16. Use the regression feature on your calculator to find a linear model. *section 1.7*
17. Graph quadratic functions in standard and vertex forms. *section 2.1*
18. Find the vertex of a quadratic function in standard form. *section 2.1*
19. Use the leading coefficient and degree of a polynomial to describe the end behavior of a polynomial in limit notation. *section 2.2*
20. Find the zeros of a polynomial algebraically using factoring. *section 2.2*
21. Use the zeros of a polynomial and the end behavior to sketch the graph of a polynomial. *section 2.2*
22. Write a polynomial function with given zeros. *section 2.2*
23. Use long division and synthetic division to divide two polynomials. *section 2.3*
24. Use the rational root test, synthetic division, and factoring to find all the zeros of a polynomial. *section 2.3*
25. Write complex numbers in terms of *i* in simplest radical form. *section 2.4*
26. Add, subtract, and multiply complex numbers. *section 2.4*
27. Find complex solutions to quadratic equations, including use of the quadratic formula. *section 2.4*
28. Determine the number of zeros of a polynomial using the fundamental theorem of algebra. *section 2.5*
29. Find all the zeros of a polynomial, both real and imaginary. *section 2.5*
30. Use a scatterplot to determine whether a linear or quadratic model would better fit a set of data. Use the regression feature on the calculator to find this model. *section 2.8*

PreCalculus Summer Assignment Factoring Review

Read the review of factoring on this page to help you factor the problems on the next page.

Factoring Summary

Before factoring any polynomial, write the polynomial in **descending order** of one of the variables.

1. Factor out the Greatest Common Factor (GCF). Look for this in **every** problem. This includes factoring out a -1 if it precedes the leading term.
   Example: $-3x^2+12x-18=-3(x^2-4x+6)$

2. If there are **FOUR TERMS**, try to factor by grouping (GR).
   Example: $x^3+6x^2-2x-12$

$\underline{x^3+6x^2}\ \ \underline{-2x-12}=$	*group the first two terms, last two terms*
$x^2(x+6)-2(x+6)=$	*factor out GCF from each grouping*
$(x+6)(x^2-2)$	*factor out the common grouping*

3. If there are **TWO TERMS**, look for these patterns:
   a. The difference of squares (DOS) factors into conjugate binomials:
      $a^2-b^2=(a-b)(a+b)$
      Example: $9x^4-64y^2=(3x^2-8y)(3x^2+8y)$
   Note: a variable is a perfect square if the exponent is even

   b. The sum of squares does not factor:
      a^2+b^2 is prime
      Example: $9x^4+64y^2$ is PRIME

4. If there are **THREE TERMS**, look for these patterns:
   a. Quadratic trinomials of the form ax^2+bx+c *where* $a=1$ ($QT\ \ a=1$) factor into the product of two binomials (double bubble) where the factors of c must add to b.
      Example: $x^2-4x-12=(x-6)(x+2)$

   b. Quadratic trinomials of the form ax^2+bx+c *where* $a\neq 1$ ($QT\ \ a\neq 1$) eventually factor into the product of two binomials (double bubble), but you must first find the factors of *ac* that add to *b*, rewrite the original replacing *b* with these factors of *ac*, then factor by grouping to finally get to the double bubble.
      Example:
      $9x^2+15x+4 \qquad ac=(9)(4)=36$
      factors of 36 *that add to* 15: 12 *and* 3
      $9x^2+12x+3x+4=$
      $3x(3x+4)+1(3x+4)=$
      $(3x+4)(3x+1)$

   c. Quadratic square trinomials (*QST*) of the form ax^2+bx+c may factor into the square of a binomial. Look for the pattern where two of the terms are perfect squares, and the remaining term is twice the product of the square root of the squares:
      $a^2\pm 2ab\pm b^2=(a\pm b)^2$
      Example: $16x^2-40x+25=(4x-5)^2$

5. Factor all expressions completely. Sometimes, you will need to use two or three types of factoring in a single problem.
   Example:

$-2x^4+32=$	*factor out the GCF of* -2
$-2(x^4-16)=$	*factor the difference of squares*
$-2(x^2-4)(x^2+4)=$	*factor the remaining difference of squares*
$-2(x-2)(x+2)(x^2+4)$	(*remember that the sum of squares is prime*)

Factoring Practice.

Use the examples on the preceding page to help you factor the following problems.

Factor each completely.

1) $-5b^4 + 15b^3 + 5b^2$

2) $-7x^3y^6 + 7xy^5z^3$

3) $a^2 + a - 72$

4) $n^2 - 4n + 4$

5) $8a^2 + 44a + 60$

6) $7x^2 - 4x - 3$

7) $54n^2 + 12n + 96$

8) $9r^2 - 51r + 70$

9) $4x^2 - 9$

10) $12r^2 - 3$

11) $294p^2 - 486$

12) $100n^2 - 140n + 49$

13) $24x^3 + 3x^2 + 56x + 7$

14) $6v^3 - 9v^2 - 14v + 21$

15) $63xy + 42x + 147y + 98$

16) $uv - 3u + 5v - 15$

PreCalculus Summer Assignment Book Problems

Your PreCalculus Summer Assignment book problems come from the chapter 1 and 2 review sections of your book. Review the vocabulary and formulas summarized under ***What did you learn?*** at the top of each section within the chapter review. Some examples are provided as well. For more examples, refer back to the section within the chapter or look up the topic in the index in the back of the book. You can also use Khan Academy as a resource to help you with questions you may have.

Show all of the work in solving each problem in the space allocated in the packet for each problem. If you run out of room in the space provided for each question, you may attach additional paper (number the problems).

Read the directions in the book for each problem. Work out your solution in the space below.

Chapter 1 Review pages 80-85

4a. (0, 1), m = 4/5

6a. (-2, 6), m = 0

8. (5/6, -1), (5/6, 3)

10. (3, -1), (-3, 2)

17. a. {(20,4), (40, 0), (20,6), (30, 2)}

b. {(10,4), (20, 4), (30, 4), (40, 4)}

24. a. g(3)

b. g(3x)

c. g(x+2)

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

Domain:

Range:

34. $f(x) = \sqrt{x+3} + 4$

Domain:

Range:

35. $f(x) = \sqrt{36 - x^2}$

Domain:

Range:

36. $f(x) = |x - 5| + 2$

Domain:

Range:

37. $3x + y^2 - 2 = 0$

Function?

How to graph:

40. $f(x) = \sqrt{x^2 - 16}$

Increasing:

Decreasing:

Constant:

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

Maximum:

Minimum:

58. parent:

Transformations:

Equation:

59. parent:

Transformations:

Equation:

60. parent:

Transformations:

Equation:

61. parent:

Transformations:

Equation:

62. parent:

Transformations:

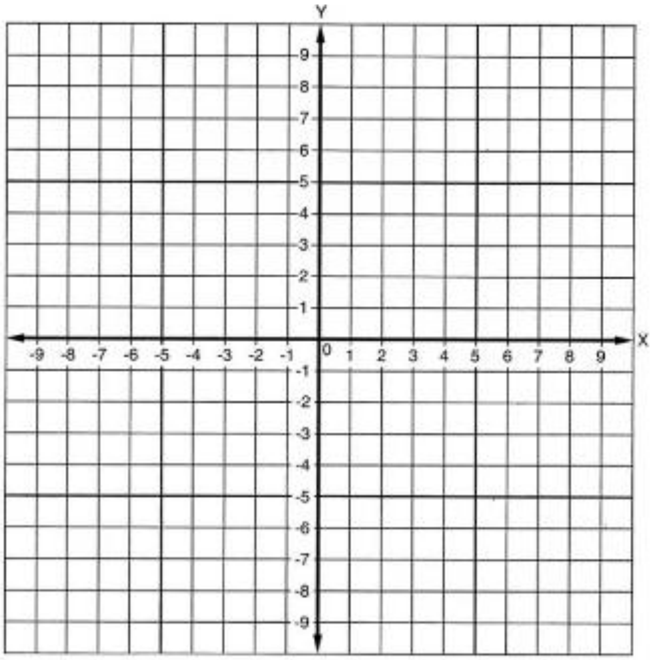
Equation:

63. parent:

Transformations:

Equation:

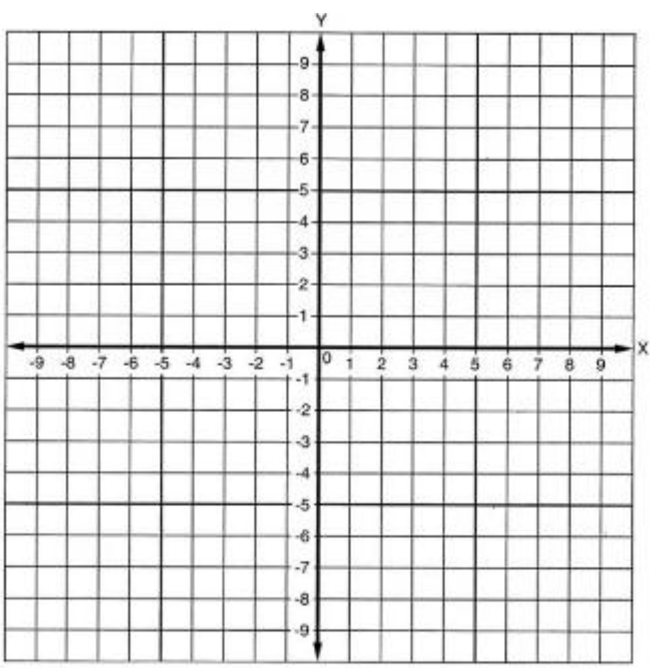
65. $y = f(-x)$



72abc. $h(x) = (-x)^2 - 8$

parent:

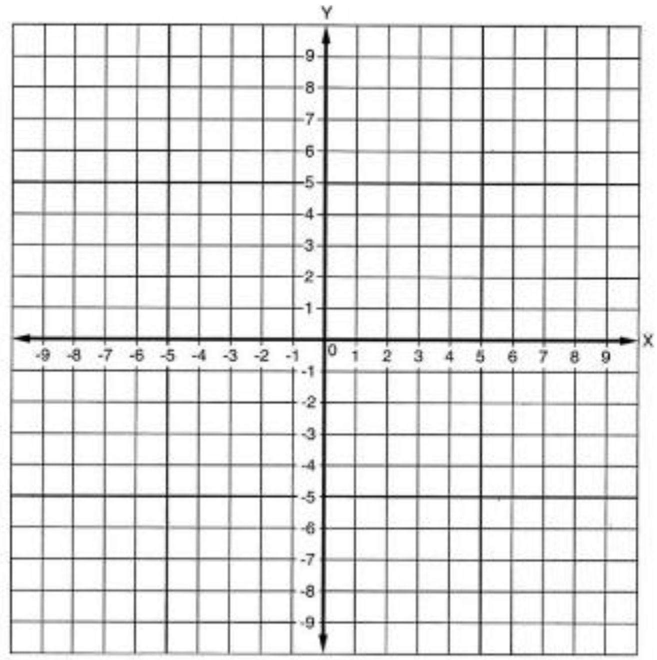
Transformations:



73 abc. $h(x) = -\sqrt{x} - 6$

parent:

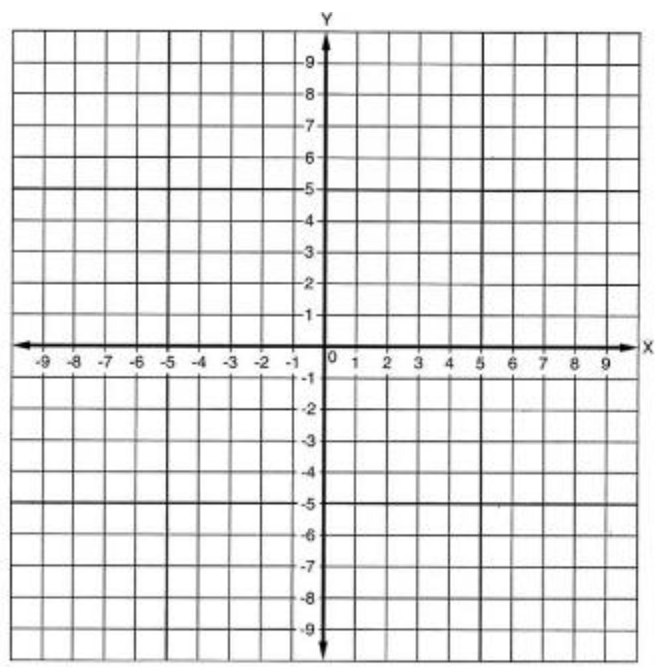
Transformations:



74 abc. $h(x) = \sqrt{x-1} + 4$

parent:

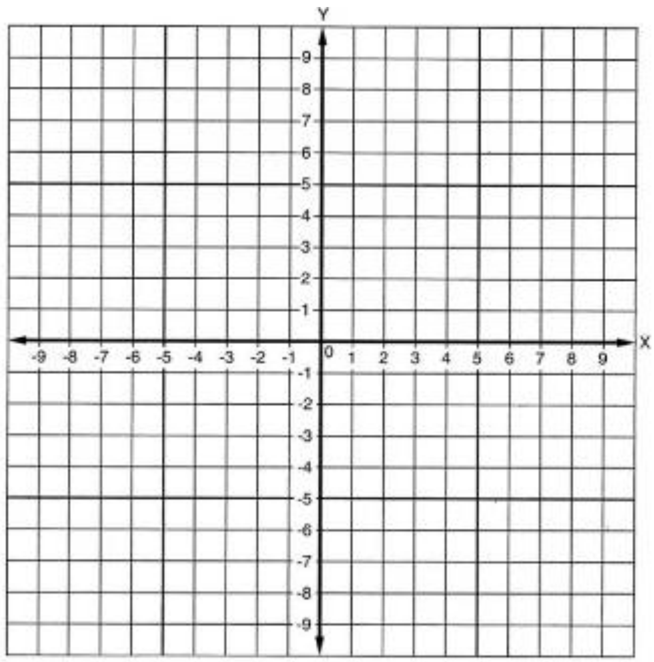
Transformations:



75abc. $h(x) = |3x| + 9$

parent:

Transformations:



83. $(h \circ g)(11) = h\big(g(11)\big) =$

84. $(g \circ f)(-3)$

88. $h(x) = \sqrt[3]{(x+2)^2}$

$f(x) =$ $\qquad\qquad$ $g(x) =$

96. $f(x) = \frac{x-5}{4}$

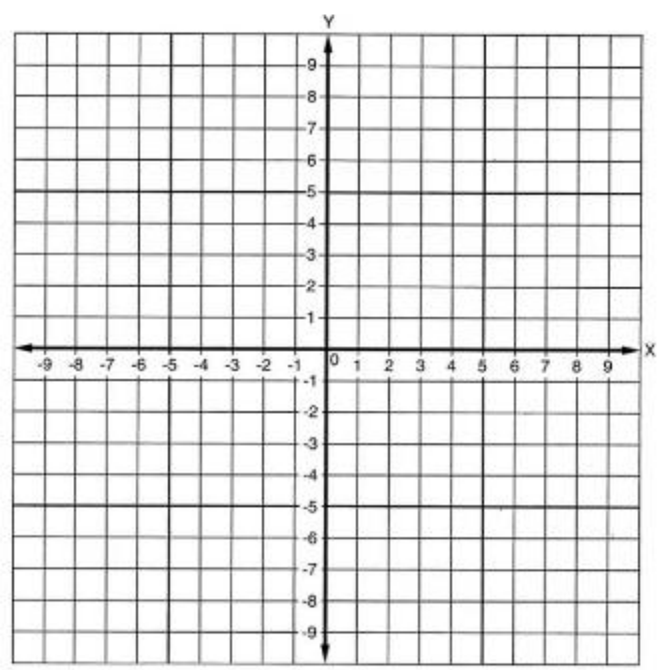
Find $f^{-1}(x)$

$f\big(f^{-1}(x)\big)$

$f^{-1}\big(f(x)\big)$

98ab. Algebraically find $f^{-1}(x)$

Graph $f(x)$ *and* $f^{-1}(x)$



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

108a(on calculator)bc. Linear model:

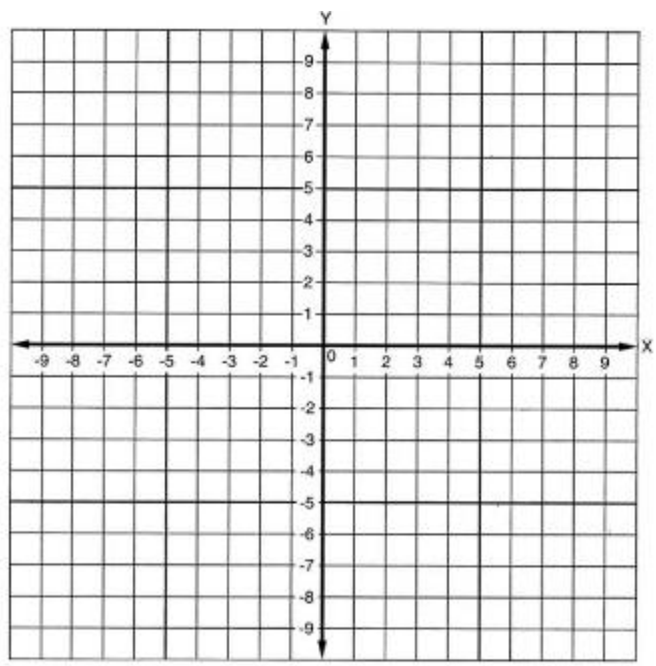
Correlation coefficient:

Predicted GPA:

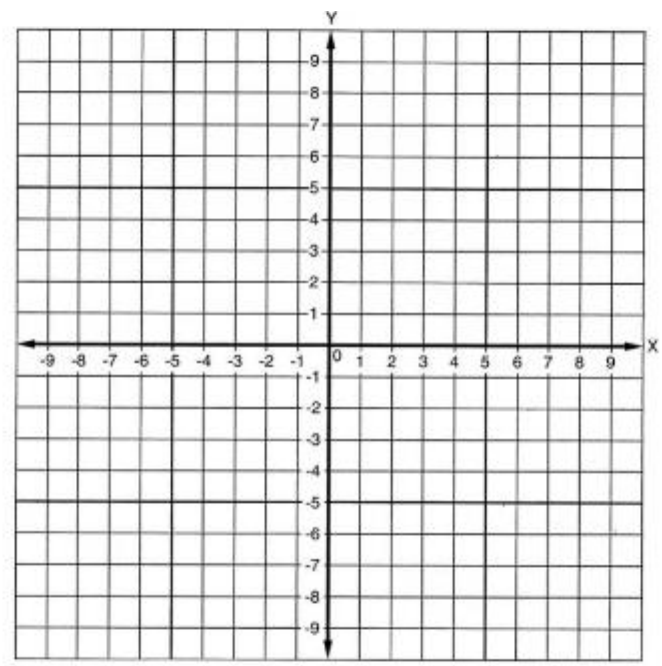
105. $f(x) = 4\sqrt{6 - x}$

Chapter 2 Review pages 168-176

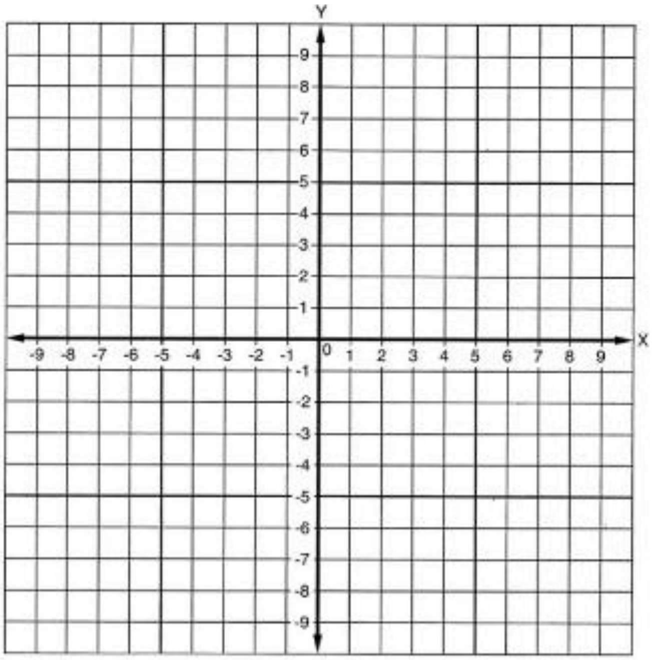
1. Comparison:



3. Comparison:



6. Comparison:

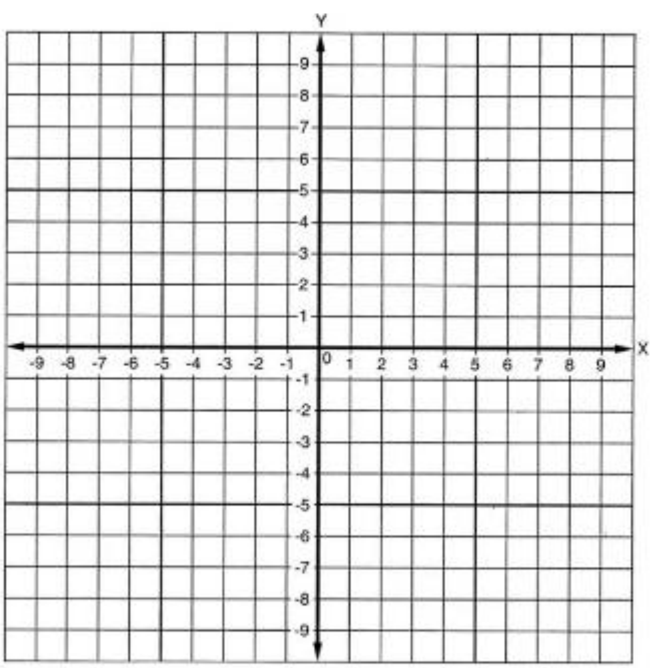


8. Standard Form:

Vertex:

Axis of Symmetry:

x-intercepts:



12. vertex: (-3, 4) point (0, -5)

Standard form:

22. Use limit notation!

Left: Right:

25. zeros algebraically (HINT – factor):

30. zeros algebraically:

31. Factored form:

Standard form:

44. $\dfrac{x^4+x^3-x^2+2x}{x^2+2x}$;

46. $(2x^3+6x^2-14x+9)\div(x-1)$

49. $f(-3)$

51. verify given factor:

Find remaining factors:

Complete factorization:

All zeros:

53.

possible zeros:

Complete factorization:

All zeros:

65. $3-\sqrt{-16}$

66. $\sqrt{-50}+8$

67. $-i+4i^2$

68. $7i-9i^2$

70. $(3-2i)+4i$

72. $(7+10i)-(1+9i)$

74. $(1+6i)(5-2i)$

76. $(4-i)^2-(4+i)^2$

84. $x^2+4x+10=0$

87. $f(x)=x^2+12$

$f(-2\sqrt{3i})$ =

$f(2\sqrt{3i})$ =

98. $f(x)=-3x^3-19x^2-4x+12$

Zeros:

Product of Linear Factors:

x-intercepts (as ordered pairs):

102. Factored form (There will be 3 factors):

Standard Form:

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

109. $f(x) = 8x^3 - 12x^2 + 2x - 3$

141. linear, quadratic, or neither

142. linear, quadratic, or neither

143. linear, quadratic, or neither

152b. linear model:

Coefficient of determination (r^2):

d. Quadratic model:

Coefficient of determination (r^2):

f. better model (explain)?

g. year?

Grading: completeness + correctness = ____/15 + ____/10 (10 random problems graded)

out of 25 (homework grade)