To maintain a high quality program, students entering Analysis of Functions are expected to remember the basics of the mathematics taught in their Algebra II course. In order to review the basic concepts prior to taking Analysis of Functions, the mathematics department has prepared this review packet. The packet will be collected and graded by the teacher during the first week of school. An assessment will be given to assess the student's knowledge of the covered topics. Be sure to **SHOW ALL WORK** to receive credit.

Part I: Expressions and Types of Numbers

1. Evaluate each algebraic expression.

a. $x^2 - 6x + 3$ for $x = 7$ b. $6 + 5(x - 6)^3$ for $x = 8$

2. Write the algebraic expression for each English phrase. Then simplify the expression.

a. A number decreased by the sum of the number and four.

b. Ten times the product of negative four and a number.

3. Label each number in the set below as a) natural numbers, b) whole numbers, c) integers, d) rational numbers, e) irrational numbers, f) real numbers (may be more than one)/

$\{-9, -\frac{4}{5}, 0, 0.25, \sqrt{3}, 9.2, \sqrt{100}\}$

4. Give an example of a rational number that is not an integer.

Part II: Exponents and Scientific Notation: Topics include: exponential rules, and scientific notation.

5. Simplify each exponential expression and write each with no negative exponents.

a. $x^{-2}y$ b. x^0y^5 c. $(3x^2y^5)^2$ d. $(3x^4)(2x^7)$

e. $\frac{25a^{13}b^4}{-5a^2b^3}$ f. $\left(\frac{3x^4}{y}\right)^{-3}$ g. $\left(\frac{4a^{-5}b^3}{12a^3b^{-5}}\right)^0$

6. Write each number in scientific notation.

a. -5716 b. 0.000083 c. 579,000,000,000

7. Simplify, then write answer in scientific notation.

a. $(2 \times 10^4)(4.1 \times 10^3)$ b. $\frac{8.4 \times 10^8}{4 \times 10^5}$

Part III: Radicals and Rational Exponents: Topics include: roots, simplifying radicals, radical operations, rationalizing denominators, and fractional exponents.

8. Simplify the expressions or indicate that the root is not a real number.

a. $\sqrt{36}$ b. $-\sqrt{36}$ c. $\sqrt{\ 36}$

d. $\sqrt{25-16}$ e. $\sqrt{10x}\bullet\sqrt{8x}$ f. $\sqrt{\dfrac{72x^3}{8x}}$

g. $7\sqrt{3}+6\sqrt{3}$ h. $\sqrt{8}+3\sqrt{2}$ i. $\sqrt[3]{-125}$

9. Rationalize the denominator.

a. $\dfrac{1}{\sqrt{7}}$ b. $\dfrac{\sqrt{7}}{\sqrt{3}}$ c. $\dfrac{3}{3+\sqrt{7}}$

10. Simplify the expression without a calculator.

a. $36^{\frac{1}{2}}$ b. $125^{\frac{2}{3}}$ c. $(7x^{\frac{1}{3}})(2x^{\frac{1}{4}})$

Part IV: Polynomials: Topics include: standard form, operations with polynomials.

11. Write the polynomial in standard form. Classify it by degree and by the number of terms: $x^2 - x^3 - 5$.

12. Simplify and write the answer in standard form.

a. $(-6x^3 + 5x^2 - 8x + 9) + (17x^3 + 2x^2 - 4x - 13)$

b. $(18x^4 - 2x^3 - 7x + 8) - (9x^4 - 6x^3 - 5x + 7)$

c. $(x + 8)(x - 1)$ d. $(x + 3)(x - 3)$ e. $(2x - 3)(5x + 3)$

f. $(8x^3 + 3)(x^2 - 5)$ g. $(x + 1)(x^2 - x + 1)$ h. $(x - 3)^2$

Part V: Factoring Polynomials: Topics include: factoring out the greatest common factor, and factoring into two binomials.

13. Factor out the greatest common factor.

a. $16x - 4$ b. $3x^2 + 6x$

c. $9x^4 - 18x^3 + 27x^2$ d. $x(x + 5) + 3(x + 5)$

14. Factor each polynomial.

a. $x^2 + 5x + 6$ b. $x^2 - 4x - 5$ c. $3x^2 - x - 2$

d. $36x^2 - 49$ e. $x^2 - 14x + 49$

Part VI: Rational Expressions: Topics include: domain, simplifying rational expressions, and operations with rational expressions.

15. Find all the numbers that must be excluded from the domain of the rational expression.

a. $\frac{7}{x-3}$ b. $\frac{x+5}{x^2-25}$

16. Simplify each rational expression.

a. $\frac{3x-9}{x^2-6x+9}$ b. $\frac{x^2+12x+36}{x^2-36}$

17. Multiply or divide and simplify if possible.

a. $\frac{x-2}{3x+9} \bullet \frac{2x+6}{2x-4}$ b. $\frac{x^2-25}{2x-2} \div \frac{x^2+10x+25}{x^2+4x-5}$

18. Add or subtract and simplify if possible.

a. $\frac{3}{x+4} + \frac{6}{x+5}$ b. $\frac{4}{x} - \frac{3}{x+3}$

Part VII: Equations: Topics include: solving linear, quadratic, radical, and absolute value equations; solve for a variable; and find the discriminant.

19. Solve each linear equation.

a. $7x - 5 = 72$

b. $11x - (6x - 5) = 40$

c. $3(x - 2) + 7 = 2(x + 5)$

d. $\frac{x}{4} = 2 + \frac{x-3}{3}$

20. Solve each formula for the specified value.

a. $T = D + pm$ for p

b. $B = \frac{F}{S-V}$ for S

21. Solve each absolute value equation.

a. $|x-2| = 7$

b. $2|3x-2| = 14$

c. $|2x-1|+3 = 3$

22. Solve each quadratic equation. You may use any method, but the most appropriate is written next to the problem.

a. $x^2 - 13x + 36 = 0$ (factoring)

b. $x^2 = -11x - 10$ (factoring)

c. $3x^2 = 27$ (square root)

d. $3x^2 - 3x - 4 = 0$ (quadratic formula)

e. $x^2 - 6x + 10 = 0$ (quadratic formula)

23. Find the discriminant and tell what it indicates about the number and types of solutions.

a. $2x^2 - 11x + 3 = 0$

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

24. Solve the radical expression $\sqrt{6x+1} = x - 1$

Part VIII: Functions

Match each function to its appropriate equation.

25. Linear

26. Quadratic

27. Cubic

28. Rational

29. Exponential

A. $2x + 3y = 12 - 4x^2$

B. $g(x) = 0.5^x - 3.5$

C. $f(x) = \frac{3x^2}{-5+2x^2}$

D. $2x + 3y = 12$

E. $2x + 3y = 2x^3$

Part IX: Graphing
Please complete each on graph paper.

30. Create a scatterplot of the following data.
Number of students enrolled in Advanced Algebra

Year	2001	2002	2003	2004	2005	2006
# of students	33	29	45	43	43	61

31. Graph the linear function and give its slope and y–intercept: $y - 1 = -\frac{1}{3}x$.

32. Graph the absolute value equation: $f(x) = |x + 4|$.

33. Graph the inequality: $f(x) > 2x - 4$.

34. Graph the linear equations.

a. $x = 1.5$ b. $y = -2$

35. Graph the system of equations and give the solution: $\begin{cases} f(x) = -x - 1 \\ f(x) = 2x - 4 \end{cases}$

36. Graph the quadratic function: $f(x) = (x + 1)^2 - 3$. Include the vertex and x-intercepts.

37. Graph the exponential function: $f(x) = 2^x - 3$.

38. Find the domain of the rational function. Identify all asymptotes and holes. Then graph: $f(x) = \frac{x+1}{x^2+4x-21}$.

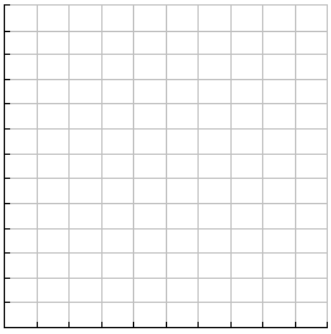
Record the answers for your summer packet on this sheet with pencil.

1. a. _____
   b. _____
2. a. _____
   b. _____
3. -9 _____
   $-\frac{4}{5}$ _____
   0 _____
   .25 _____
   $\sqrt{3}$ _____
   9.2 _____
   $\sqrt{100}$ _____
4. _____
   _____
5. a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____
   g. _____

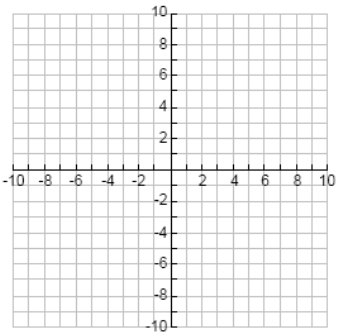
6. a. _____
   b. _____
   c. _____
7. a. _____
   b. _____
8. a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____
   g. _____
   h. _____
   i. _____
9. a. _____
   b. _____
   c. _____
10. a. _____
    b. _____
    c. _____

11. _____
    _____
12. a. _____
    b. _____
    c. _____
    d. _____
    e. _____
    f. _____
    g. _____
    h. _____
13. a. _____
    b. _____
    c. _____
    d. _____
14. a. _____
    b. _____
    c. _____
    d. _____
    e. _____

15. a. _____
b. _____
16. a. _____
b. _____
17. a. _____
b. _____
18. a. _____
b. _____
19. a. _____
b. _____
c. _____
d. _____
20. a. _____
b. _____
21. a. _____
b. _____
c. _____
22. a. _____
b. _____
c. _____
d. _____
e. _____
23. a. _____
b. _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30.



31.



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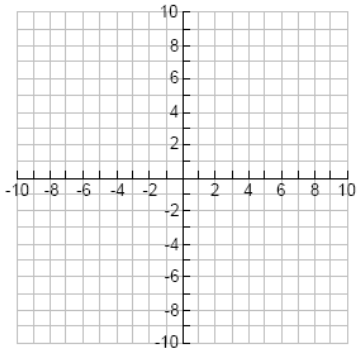

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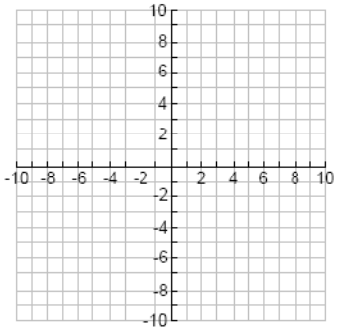

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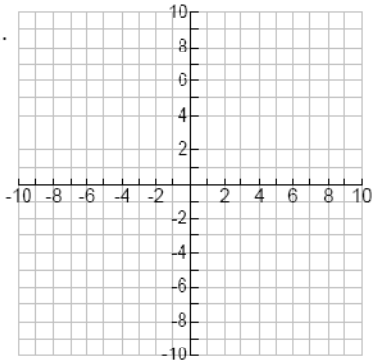
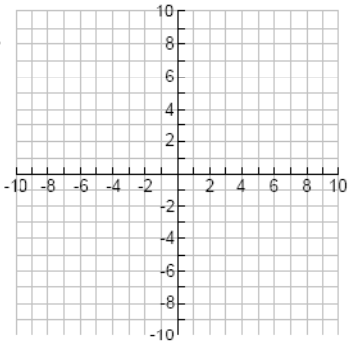


b.



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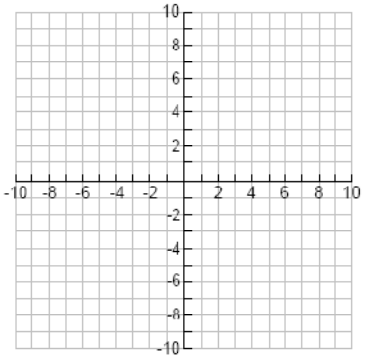

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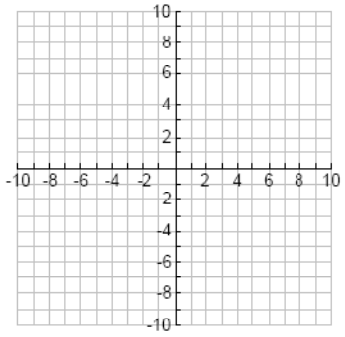

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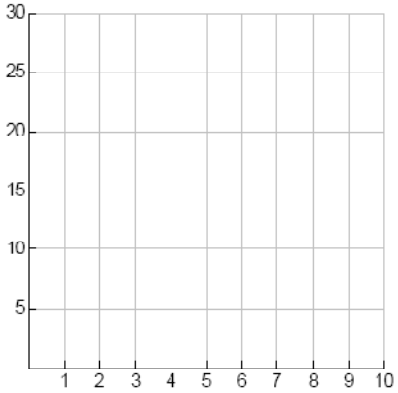

38.