AMHS GSE Precalculus Summer Assignment

The following exercises will give you an opportunity to refresh your prior knowledge and skills from Coordinate Algebra, Analytic Geometry and Advanced Algebra, in preparation for Pre-Calculus. For the following problems, write out your steps or show how you arrived at answers for each problem. This assignment is due by August 18, 2017.

Prerequisite Skills:

1. Order of operations with integers, fractions and exponents.
2. Simplify exponents, including fractional and negative exponents.
3. Simplify radicals.
4. Solve equations including linear, literal, absolute value, quadratic, and radical.
5. Solve systems of linear equations.
6. Solve and graph linear and compound (system of) inequalities.
7. Determine slope, write linear equations in various forms, perpendicular and parallel lines.
8. Graph equations, functions, and inequalities and shifts/transformations from parent graphs.
9. Indentify domain, range, and asymptotes.
10. Write and sketch inverse function and composition of functions.
11. Factoring including greatest common term, difference of squares, trinomials.
12. Operations with polynomials.
13. Basic Geometry concepts for triangles, polygons, and circles.
14. Area and Volume.
15. Right triangle concepts including basic trigonometry ratios and Pythagorean Theorem.

If you have difficulty with any of these topics, review your notes from prior classes.

You can also **look** on the internet for tutorials on specific topics on websites such as

- www.purplemath.com
- www.wtamu.edu/academic/anns/mps/math/mathlab
- www.math.armstrong.edu/MathTutorial
- www.mathsisfun.com

 or any other websites from your preferred search engine. Be persistent and resourceful until you find a tutorial that is helpful, understandable, and provides good examples with answers for you to follow. Don't accept just "getting an answer" as it is important that you understand *how* to successfully complete these types of review problems.

If you are still having questions about any of the above topics, please ask your teacher for assistance when school begins.

Part One: Order of Operations with Integers, Fractions, and Exponents.

Simplify the following algebraic and numeric expressions. Remember, Add/Subtract and Multiply/Divide are same level skills. As you PEMDAS, you do not do all P, all E, all M then all D, all A and then all S. You work all P, all E, all M/D as you move from left to right, then all A/S as you move from left to right.

1. $7 + (9 - 3 \cdot 4)^2$

2. $\dfrac{\frac{2}{3} + \frac{1}{5}}{\frac{1}{2}}$

3. $-2^{-2} - (4 + 3 \cdot 5)$

4. $(5^{-1} + 3^0)(a^0)$

5. $(7x - 2y) - (3x + 5y)$

6. $(7x - 2y)(3x + 5y)$

7. $5[2(y + 1) - 5(y - 2)]$

8. $\left(\dfrac{x^2 + 2x - 3}{x + 2}\right)\left(\dfrac{x^2 + 2x}{x^2 - 1}\right)$

11. $\dfrac{y}{1+z} + \dfrac{1+z}{y}$

12. $\dfrac{1 + \frac{1}{t}}{1 - \frac{1}{t}}$

Part Two: Simplify exponents, including fractional and negative exponents.

Simplify without a calculator, giving answer in exact form (not decimal). In your answer, express all exponents as positive values and convert any fractional powers to radical form.

10. $\dfrac{\dfrac{5t^5}{8}}{\dfrac{15t^2}{12}}$

11. $\dfrac{8^{-\frac{1}{3}}}{16^{\frac{1}{2}}}$

12. $\left(\dfrac{x^2 y^{-8} z^2}{xy^2 z^{-6}}\right)^{-2}$

13. $x^4(-2x)^3(6x^0)^{-2}$

14. $\left(\left(\dfrac{3}{4}\right)^2 + 1\right)^{\frac{1}{2}}$

15. $72^{\frac{1}{2}} + 98^{\frac{1}{2}}$

Part Three: Simplify radicals.

Find the exact value **without** your calculator (no decimal answers). Repeating or irrational decimals are NOT exact.

16. $3\sqrt{700} + 2\sqrt{7}$

17. $\dfrac{4\sqrt{2}}{5} - \dfrac{3}{\sqrt{2}}$

18. $\sqrt{\dfrac{20}{27}}$

Part Four: Solving Equations.

Solve each equation algebraically; verify your solution by substituting in the original equation.

19. $3(x-7)+5 = -2x-8$

20. $\dfrac{1}{4}+\dfrac{3}{8}y = \dfrac{3}{4}$

21. $\dfrac{x+1}{3}+\dfrac{x+2}{7}=5$

22. $z^2+z-12=0$

23. $x^2+3x=-1$

24. $(x+7)(x-1)=(x+1)^2$

25. $\sqrt{15-2x}=x$

26. $|1-4t|=5$

27. $\left|\dfrac{x}{3}+\dfrac{2}{5}\right|=2$

28. $2\pi-x=\dfrac{5\pi}{3}$; solve for x in terms of π.

29. $\dfrac{x}{a}+\dfrac{x}{b}=c$; where $a \neq 0, b \neq 0, a \neq -b$, solve for x.

30. $S=\dfrac{a}{1-r}$; solve for r.

Part Five: Solve systems of linear equations.

Find the solution to the system of equations.

31. $\begin{cases} 3b-a=-7 \\ 5a+6b=14 \end{cases}$

32. $\begin{cases} 3x+2y=22 \\ 9x-8y=-4 \end{cases}$

Part Six: Solve and graph linear and compound (system of) inequalities.

Show the solutions to the inequality by solving (#35), and graphing the solution for systems of linear inequalities (#33, #34).

33. $\begin{cases} 3x+5y \le 3 \\ 4y+x \ge 8 \end{cases}$

34. $\begin{cases} 9x+3y \ge -3 \\ 2x-3y \le -8 \end{cases}$

35. $-5 < 4-3x \le 2$

Part Seven: Determine slope, write linear equations in various forms, perpendicular and parallel lines.

36. Determine the slope between the points (4, -3) and (-6, 4).

37. Determine the slope of the line $-2y - x = -2$.

38. Write in slope-intercept form the equation of the line containing the point (-1, 2) and parallel to the given line $y = 2x + 4$.

39. Write in slope-intercept form the equation of the line containing the point (4, 5) and perpendicular to the given line $y = 6x - 1$.

Part Eight: Graphs of equations, functions, and inequalities and shifts/transformations from parent graphs.

You should know how to do these by looking at the equations and explaining the reason for your answers, but may use your graphing calculator to verify your answers.

40. From the parent graph of $y = x^2$, describe the shift to obtain the new graph of $y = (x-3)^2 + 4$.

41. From the parent graph of $y = \sin x$, describe the shift and transformation to obtain the new graph

    of $y = \sin(2x + \pi) - 2$.

42. State whether the given set of points is a relation or a function.

    $\{(-1, 2), (3, 10), (-2, 20), (3, 11)\}$

Part Nine: Indentify domain, range, and asymptotes.

43. For the points given in problem #42 above, state the domain and range.

44. In what interval is the function $f(x) = \sqrt{x^2 + 5x + 4}$ defined.

45. State the domain and range of the function $f(x) = \sqrt{25 - x^2}$.

46. State the domain of the function $f(x) = \dfrac{x-7}{x^2-1}$. Then state its horizontal and vertical asymptotes,

    if any exist.

Part Ten: Write and sketch inverse function and find composition of functions.

47. Given $f(x) = \dfrac{1}{2}x - 1$, find its inverse $f^{-1}(x)$. Sketch the graph of both.

48. Given $f(x) = -2x + \dfrac{1}{2}$, find its inverse $f^{-1}(x)$. Sketch the graph of both.

    For #49 and 50 use the following: $f(x) = \dfrac{2}{x+4}$, $g(x) = x^2 - 2$

49. Find $f \circ g(x)$.
50. Find $g \circ f(x)$.

Part Eleven: Factoring including greatest common term, difference of squares, trinomials.

51. $9y^2 - 900$

52. $4xy^2 - 4xz^2$

53. $x^2 - 7x + 6$

54. $12a^2 + 36a + 27$

55. $3x^3 - 15x + 2x^2y - 10y$

Part Twelve: Operations involving polynomials.
Complete the indicated operation to simplify the polynomials. Rational answers should have a common denominator.

56. $\dfrac{x^2 + 6x + 8}{x^2 - 4x + 3} \cdot \dfrac{x^2 - 5x + 4}{5x + 10}$

57. $\dfrac{x^2 + 8x}{9x} \div \dfrac{x^2 - 64}{3x^2}$

58. $\dfrac{4}{x^2 + 5x + 6} + \dfrac{2x}{x + 2}$

59. $\dfrac{3}{x - 1} - \dfrac{2}{x - 2}$

Part Thirteen: Basic Geometry concepts for triangles, polygons, and circles.

60. If the vertex angle of an isosceles triangle measures 46°, what is the measure of its base angles?

61. If one angle of a parallelogram measures 32°, what are the measures of the remaining three angles?

62. What are the lengths of the missing sides of a 30° – 60° – 90° triangle if the longer leg of the triangle is 18 centimeters?

63. The hypotenuse of a 30° – 60° – 90° triangle is 3 inches. Find the measures of the other two sides.

64. What is the length of the hypotenuse of a 45° – 45° – 90° triangle if one leg measures 9 centimeters?

65. The leg of a 45° – 45° – 90° triangle is 4 centimeters. Find the measures of the other two sides.

66. If the radius of a circle is 6 centimeters, what is its exact circumference?

67. What are "shortcuts" for proving triangles are congruent? What are "shortcuts" for showing triangles are similar?

Part Fourteen: Area and Volume.

68. If the radius of a circle is 6 centimeters, what is its area?

69. What is the area of a triangle with base of 17 cm and altitude to the base of 4 cm?

70. If the base of a parallelogram is 15 inches and altitude to the base is one third of the base, what is the area of this parallelogram?

Part Fifteen: Right triangle concepts including basic trigonometry ratios
and Pythagorean Theorem.

71. Use the right triangle shown here to state the trigonometric values for Sine, Cosine, and Tangent of angle A.
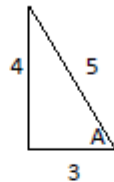
72. Use your calculator to find the measure of angle A above to the nearest tenth degree.

73. Knowing that $360° = 2\pi$, state the measure of $30°, 45°, 60°,$ and $90°$ in terms of π. Show your work to find these values.

74. In a right triangle the two legs are measures of 4x and 3x with a hypotenuse measurement of 5x. If the area of the triangle is 24 square units, find the Cosine of each acute angle.

75. Find the diagonal length of a television screen that is 30 inches wide and 20 inches long to the nearest hundredth of an inch.