PreCalc U
Summer Assignment

This assignment will be due on the **first day of school**, and there will be a **quiz** over this assignment by the end of the first week of school. Both the assignment and the quiz will be graded, and will go toward your 1st quarter grade.

The following questions will review topics covered in your Algebra I and II classes. Please note that this assignment is intended to prepare you for a rigorous college-level course. These are topics that you need to know in order to be successful in the course. The assignment is intended for you to work on in small parts throughout the summer. **You should not wait until the last minute to complete this.**

Your work should be neat, organized, and labeled with your final answer circled. Your work should be done in pencil. If I cannot read your work or your answers you will not get credit.

Topic 1: Algebra Essentials

1. Draw a number line, and label the points with coordinates $0, 1, -1, \frac{5}{2}, -2.5, \frac{3}{4}, 0.25$.

2. Write the statement as an inequality.

    a. x is positive

    b. y is between -6 and -1

    c. x is greater than or equal to 2

3. If $x = 4$ and $y = -1$, evaluate:
    a. $2x + y$

b. $\dfrac{x+y}{x-y}$

c. $|x + y|$

d. $|x| + |y|$

4. Simplify
   a. $(-3)^2$

   b. -3^2

   c. 3^{-2}

   d. $(2x^2)^3$

Topic 2: Polynomials

5. Perform the indicated operation. Express your answer as a single polynomial in standard form.
   a. $(x^3 + 3x^2 + 2) + 3(x^2 - 4x + 4)$

b. $8(4x^3 - 3x^2 - 1) - 3(2x^3 + 8x - 2)$

c. $(2x + 3)(x + 5)$

d. $(2x - 3)^2$

6. Use long division to find the quotient and remainder for $3x^3 - x^2 + x - 2$ divided by $x + 2$.

7. Factor

a. $x^2 - 9$

b. $3 - 27x^2$

c. $x^2 + 5x + 4$

d. $3x^2 - 12x + 15$

e. $x^3 + 125$

f. $3y^3 - 18y^2 - 48y$

Topic 3: Rational Expressions

8. Simplify by writing in lowest terms.

   a. $\dfrac{x^2 - 2x}{3x - 6}$

   b. $\dfrac{3x^2 - x - 2}{3x^2 + 5x + 2}$

9. Perform the indicated operation and simplify the result. Leave your answer in factored form.

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

b. $\dfrac{\frac{6x}{x^2-4}}{\frac{3x-9}{2x+4}}$

c. $\dfrac{3}{x} - \dfrac{6}{x}$

d. $\dfrac{2x-5}{3x+2} + \dfrac{x+4}{3x+2}$

e. $\dfrac{3x+5}{2x-1} - \dfrac{2x-4}{2x-1}$

Topic 4: Roots and Exponents

10. Simplify each expression. Assume that all variables are positive when they appear.

    a. $\sqrt[4]{16}$

    b. $\sqrt[3]{54}$

    c. $\sqrt[5]{x^{10}y^5}$

    d. $\sqrt{9x^5}$

11. Rationalize the denominator. Assume that all variables are positive when they appear.

    a. $\frac{2}{\sqrt{3}}$

    b. $-\frac{\sqrt{3}}{2\sqrt{2}}$

12. Simplify each expression.

    a. $4^{3/2}$

b. $9^{-3/2}$

c. $(8x^3y^6)^{1/3}$

Topic 5: Solving Equations

13. $2x - 3 = 5$

14. $8x - (2x + 1) = 3x - 10$

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

16. $4z^3 - 8z = 0$

17. $3x^3 + 4x^2 = 27x + 36$

Topic 6: Inequalities

18. Write the inequality using interval notation, and draw a number line to illustrate the inequality.
    a. $-1 < x < 5$

    b. $x \leq 5$

19. Write the interval as an inequality involving x, and draw a number line to illustrate the inequality.
    a. $[2,5]$

    b. $(-\infty, -3)$

20. Solve the inequality. Express your answer using interval notation. Graph the solution set.
    a. $x + 1 < 5$

    b. $2x - 2 \geq 3 + x$

    c. $\frac{1}{2}(x - 4) > (x + 8)$

Topic 7: Complex Numbers

21. Write each expression in the standard form $a + bi$.
    a. $(2 - 3i) + (6 + 8i)$

    b. $3(2 - 6i)$

c. $(-6 + i)(-6 - i)$

d. $\dfrac{6-i}{1+i}$

e. i^{23}

f. $6i^3 - 4i^5$