SUMMER MATH ASSIGNMENT

AP PRECALCULUS with LIMITS (5450) / AP PRECALCULUS (5440)

You are taking AP PreCalculus with Limits (5450) or AP PreCalculus (5440) in the fall. A mastery and proficiency of the following Algebra I and Algebra II skills are necessary for success in these courses. Print the first four pages of this packet and complete the work on the graphs provided. For the remainder of the packet, work on each problem in order on separate loose leaf paper. Copy the problem, show all work in a neat and organized manner. Box your final answer.

This assignment is **MANDATORY**, and is required to be completed on the first day of school. Since the material is prerequisite material you are responsible for having learned and retained the concepts. If you struggle with a topic it is suggested you use Khan Academy to find videos to help review the topic. You will be assessed on this material at the beginning of the school year.

Name: _____

Last Math Class Taken: _____

Last Math Teacher: _____

SUMMER MATH ASSIGNMENT **NAME** _____

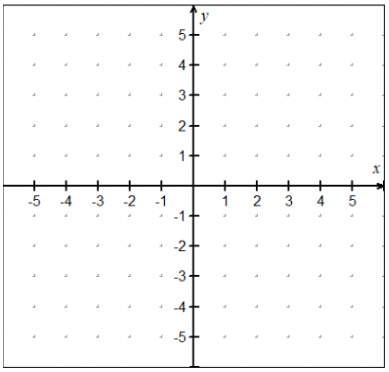
Part I: Graphs of Parent Functions

Graph each function and state the domain and range.

1. $y = x^{\square}$

Domain:

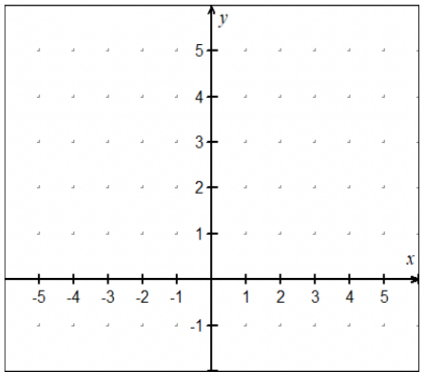
Range:



2. $y = x^2$

Domain:

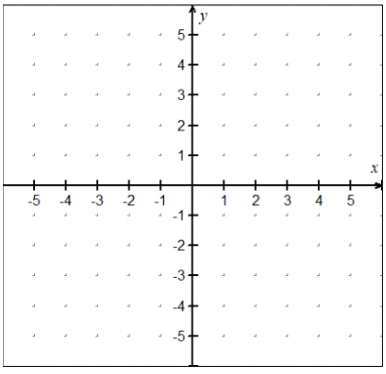
Range:



3. $y = x^3$

Domain:

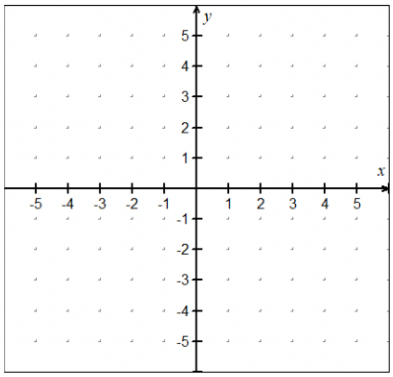
Range:



4. $y = |x|$

Domain:

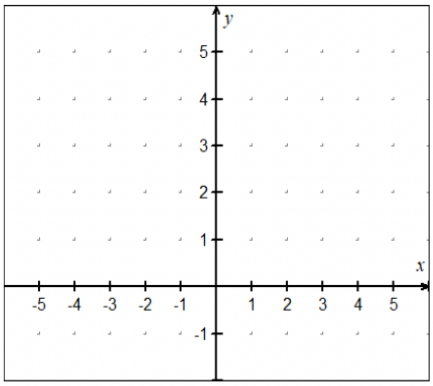
Range:



5. $y = \sqrt{x}$

Domain:

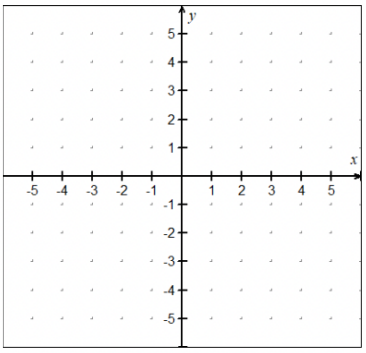
Range:



6. $y = \frac{1}{x}$

Domain:

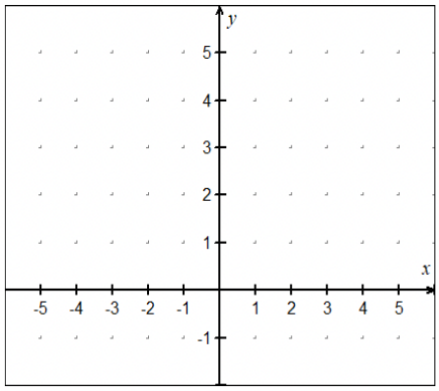
Range:



7. $y = e^x$

Domain:

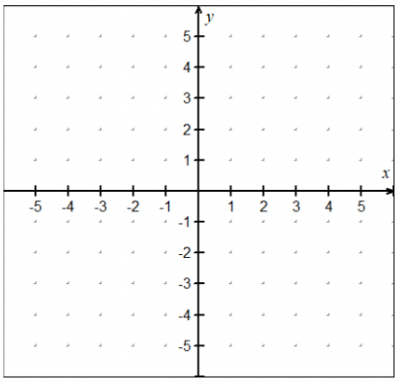
Range:



8. $y = ln\, x$

Domain:

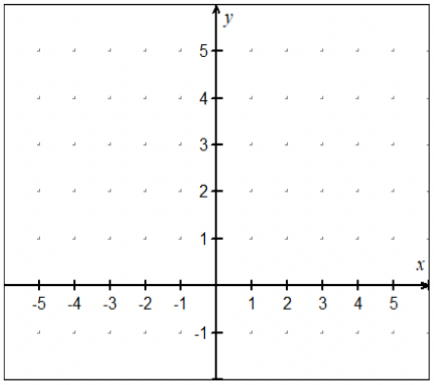
Range:



9. $y = 2^x$

Domain:

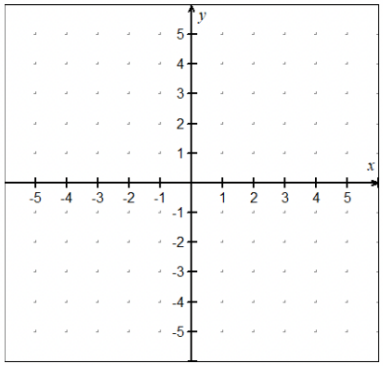
Range:



10. $y = log_2 x$

Domain:

Range:

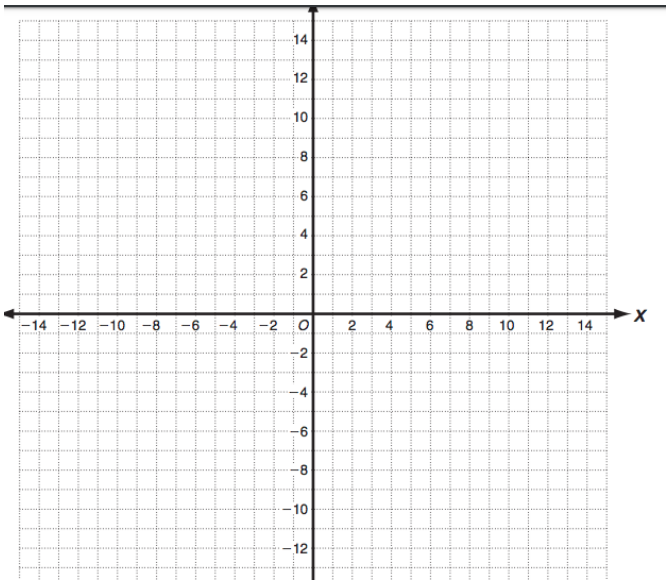


PART II: PIECEWISE FUNCTIONS

Graph each function on the axes provided.

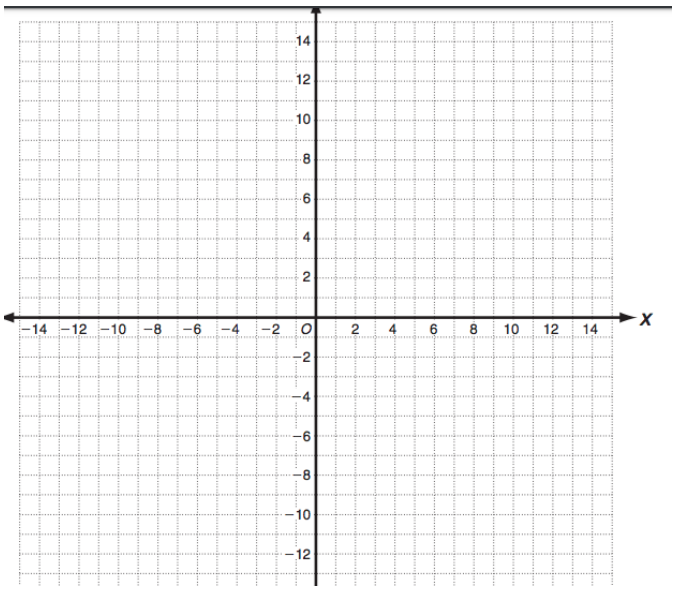
a. Let $f(x) = \begin{cases} 9x - 4 & if\ x > 3 \\ \frac{1}{2}x + 1 & if\ x \leq 3 \end{cases}$

Find *f (-4), f(2), f(3)* and *f(5)* then graph the function.



b. Let $f(x) = \begin{cases} 1 + x & if\ x < 0 \\ x^2 & if\ x \geq 0 \end{cases}$

Graph the function.



SUMMER MATH ASSIGNMENT

PART III: ALGEBRA ESSENTIAL

1. Let U= universal set = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} and let A={1, 3, 4, 5, 9}, B={2, 4, 6, 7, 8 } and C={1, 3, 4 6}, find each of the following.
    a. $A \cup B$
    b. $A \cup C$
    c. $A \cap B$
    d. $(A \cup B) \cap C$
    e. $(A \cap B) \cup C$

2. Find the value of each expression if x=3 and y = - 2.
    a. $|x + y|$
    b. $|x| + |y|$
    c. $|x| - |y|$
    d. $\frac{|x|}{x}$

3. Determine the domain of each expression. Write using set-builder notation.
    a. $f(x) = \frac{4}{x-5}$
    b. $f(x) = \frac{x}{x^2-9}$
    c. $f(x) = \frac{x^2+5x-10}{x^3-x}$
    d. $f(x) = \sqrt{2 - x}$

4. Simplify the expression. Express the answer so that all exponents are positive.
    a. $\left(-4x^2\right)^{-1}$
    b. $\frac{\left(x^2y^3\right)}{xy^4}$
    c. $\frac{\left(4x^2(yz)^{-1}\right)}{2^3x^4y}$
    d. $\left(\frac{\left(5x^{-2}\right)}{6y^{-2}}\right)^{-3}$

PART IV: POLYNOMIALS

1. Add, subtract or multiply, as indicated.
    a. $(x^2 + 4x + 5) + (3x - 3)$

b. $(x^2 - 3x - 4) - (x^3 - 3x^2 + x + 5)$
c. $9(y^2 - 3y + 4) - 6(1 - y^2)$
d. $(4x + 5)(x + 2)$
e. $(x - 2)^2$
f. $(3x - 2)^3$

2. Find the quotient and the remainder.
   a. $4x^5 - 3x^2 + x + 1$ divided by $2x^3 - 1$
   b. $3x^4 - x^3 + x - 2$ divided by $3x^2 + x + 1$

3. Factor completely.
   a. $x^2 - 36$
   b. $2 - 8x^2$
   c. $4x^2 - 8x + 32$
   d. $x^3 + 8x^2 + 32$
   e. $x^6 + 2x^3 + 1$
   f. $x^7 - x^5$
   g. $(x - 1)^2 - 2(x - 1)$
   h. $8x^3 + 27$
   i. $x^3 + 2x^2 - x - 2$

4. Use synthetic division to determine whether x-c is a factor of the given polynomial.
   a. $4x^3 - 3x^2 - 8x + 4\,;\ x - 2$
   b. $3x^4 + x^3 - 3x + 1\,;\ x + 1/3$

5. Quadratic Analysis

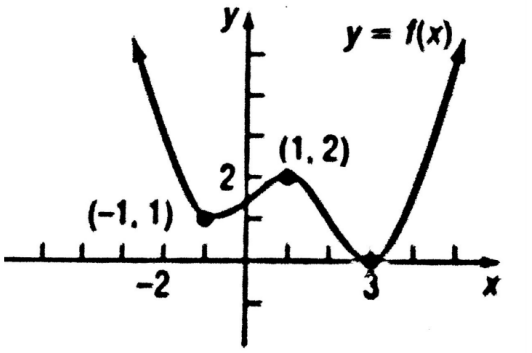
a. Let $f(x) = 2x^2 + 5x - 3$, **graph** the quadratic by analyzing the 5 key parts of the function. Use your own graph paper.

Part I : Put the equation into vertex form:
Part II: Find the 5 key parts:
1. Vertex:
2. Axis of Symmetry:

3. X-intercept (if any):
4. Y-intercept:
5. Point symmetric to the y-intercept:

6. Graphical Analysis

Using the graph below, answer the following questions:



a. At what number(s), if any, does f have a local maximum?
b. What are the local maxima?
c. At that number(s), if any, does f have a local minimum?
d. What are the local minima?
e. List all the intervals on which f is increasing?
f. List all the intervals on which f is decreasing?
g. State the domain.
h. State the range.
i. What are the x-intercepts?
j. What are the y-intercepts?
k. Where is $f(x) > 0$
l. Where is $f(x) < 0$

PART V: RATIONAL EXPRESSIONS

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

a. $\frac{4x^2}{x^2-16} \times \frac{x^3-64}{2x}$

b. $\frac{\frac{8x}{x^2-1}}{\frac{10x}{x+1}}$

c. $\frac{3x^2}{2x-1} - \frac{9}{2x-1}$

d. $\frac{x}{x^2-4} + \frac{1}{x}$

e. $\frac{x}{x-3} - \frac{x+1}{x^2+5x-24}$

f. $\frac{4+\frac{1}{x^2}}{3-\frac{1}{x^2}}$

PART VI: SOLVING EQUATIONS

1. Solve each equation.
   a. $5-(2x-1)=10$
   b. $x(x^2+1)=3+x^3$
   c. $\frac{2}{2x-3}=\frac{2}{x+5}$
   d. $\frac{1}{2x+3}+\frac{1}{x-1}=\frac{1}{(2x+3)(x-1)}$
   e. $|2x+3| = 5$
   f. $2x^2-5x-3=0$
   g. $x + \frac{12}{x} = 7$
   h. $(2y+3)^2 = 9$
2. Solve by completing the square.
   a. $x^2-6x=13$
   b. $2x^2-3x-1=0$

3. Solve. Use the quadratic formula.
   a. $2x^2-5x+3=0$
   b. $4x^2=1-2x$

4. Use the discriminant to determine whether each quadratic has two real solutions, a repeated solution, or no real solutions.
   a. $x^2+5x+7=0$
   b. $2x^2-3x-4=0$
   c. $25x^2-20x+4=0$

PART VII: COMPLEX NUMBERS

1. Perform the indicated operations and write each expression in standard form, a+bi.
    a. $(4 + 5i) + (-8 + 2i)$
    b. $-4(2 + 8i)$
    c. $(5 + 3i)(2 - i)$
    d. $\frac{2-i}{-2i}$
    e. $\frac{6-i}{1+i}$
    f. i^{14}
    g. $i^6 - 5$
    h. $\sqrt{-12}$

2. Solve each equation in the complex number system.
    a. $x^2 + 25 = 0$
    b. $5x^2 + 1 = 2x$

PART VIII: INTERVAL NOTATION

1. Write each inequality in interval notation, and graph on the real number line.
    a. $0 \leq x \leq 4$
    b. $x \geq -3$
    c. $x \leq 1$
    d. $-1 < x < 5$

PART IX: INEQUALITIES

1. Solve each inequality. Express your answer using interval notation.
    a. $2x - 2 \geq 3 + x$
    b. $4 \leq 2x + 2 \leq 10$
    c. $-3 < \frac{2x-1}{4} < 0$
    d. $|3x| > 12$
    e. $|2x + 5| \leq 7$
    f. $|1 - 2x| > 3$

PART X: NTH ROOTS, RATIONAL EXPONENTS

1. Simplify each expression. Assume that all variables are positive when they appear.
   a. $\sqrt[3]{-8}$
   b. $\sqrt{45x^3}$
   c. $\sqrt[4]{x^{12}y^8}$
   d. $\sqrt[3]{\frac{3xy^2}{81x^4y^2}}$
   e. $\left(3\sqrt{6}\right)\left(2\sqrt{2}\right)$
   f. $2\sqrt{12} - 3\sqrt{27}$
   g. $\left(\sqrt{x}-1\right)\left(\sqrt{x}+1\right)$
   h. $8xy - \sqrt{25x^2y^2} + \sqrt[3]{8x^3y^3}$

2. Rationalize the denominator.
   a. $-\frac{3}{\sqrt{3}}$
   b. $\frac{\sqrt{3}-1}{2\sqrt{3}+3}$

3. Simplify the expression.
   a. $100^{\frac{3}{2}}$
   b. $16^{-\frac{3}{2}}$
   c. $\left(-\frac{64}{125}\right)^{-\frac{2}{3}}$