Welcome to Honors Precalculus! To ensure that we are able to cover the necessary material to best prepare our honors students for AP Calculus and AP Statistics, it is expected that incoming honors students have a proficient understanding of Algebra 2 and Geometry. The summer work will give you the opportunity to evaluate how well you learned the material from the last few years and refresh your memory on essential concepts from previous courses that will be further explored in Precalculus.

The main purpose of the assignment is for students to self-evaluate their preparedness for Precalculus, students need to complete one of the following options listed below:

- Use the topics provided in the packet to write a letter describing your understanding and mastery of the prerequisite concepts and skills needed for Precalculus Honors. Be sure to include mathematical evidence (visuals, definitions and example problems)
- Complete the set of problems provided in the packet and summarize key insights needed for problem solving

Students will take a readiness assessment during the first week of school based on the concepts and skills included in the packet. We will use the summer work and readiness assessment to support students in strategizing about how to make decisions and approach this class.

Your completed summer work can be submitted in person at registration. However, if you are not able to make it to registration, please submit your work to CulverHighsummerwork@ccusd.org. In the subject line, please include - Full name and Subject.

We look forward to meeting you all in August!

Ms. Ramirez and Dr. Yen

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Use your knowledge of parent functions to sketch the graph of each equation. Then analyze the graph of the function, stating all key features relevant to the function.

1. \( f(x) = (x - 3)^2 + 2 \)
2. \( h(x) = \sqrt{5 - x} - 1 \)
3. \( g(x) = \frac{1}{x-2} + 1 \)
4. \( m(t) = \left(\frac{1}{2}\right)^{t-1} \)
5. \( k(x) = \ln(4 - x) \)
6. \( p(t) = 100e^{-2.5t} \)
Use your knowledge of parent functions to write an equation for the function shown in each graph.
Use the graphs of $f$ and $g$ to graph $h(x) = f + g$

**Analyzing Arithmetic Combinations of Functions**

a. Use the graphs of $f$ and $(f + g)$ in Figure 2.64 to make a table showing the values of $g(x)$ when $x = 1, 2, 3, 4, 5,$ and $6$. Explain your reasoning.

b. Use the graphs of $f$ and $(f - h)$ in Figure 2.64 to make a table showing the values of $h(x)$ when $x = 1, 2, 3, 4, 5,$ and $6$. Explain your reasoning.
Use the graphs of \( f \) and \( g \) to evaluate the composite functions.

(a) \((f \circ g)(2)\)  
(b) \((g \circ f)(2)\)

Use the table for the function \( f \) to evaluate the composite functions.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
<th>( g(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>3</td>
<td>-7</td>
</tr>
<tr>
<td>-1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>\text{undefined}</td>
</tr>
<tr>
<td>4</td>
<td>-2</td>
<td>2</td>
</tr>
</tbody>
</table>

(a) \((g \circ f)(4)\)  
(b) \(f(g(0))\)  
(c) \((f \circ f)(3)\)

Use the graph of \( f(x) \) and \( g(x) \) below to sketch the graph of \( g(f(x)) \) and state the domain.

8. **Table of a**

For each function \( h \), find two functions \( f \) and \( g \) such that \( h(x) = f(g(x)) \).

(a) \( h(x) = \sqrt{x^2 + 6} \)  
(b) \( h(x) = (5x - 8)^6 \)

(c) \( h(x) = 2^{(6x + 7)} \)  
(d) \( h(x) = \frac{1}{x^3 - 7x + 2} \)

(e) \( h(x) = \sin^2(10x + 5) \)  
(f) \( h(x) = \sqrt[3]{(x + 4)^2} \)
Determine whether each of the functions below is even, odd or neither algebraically.

\[ f(x) = \frac{x^3 - x}{x - 1} \]
\[ f(x) = |x - 1| \]
\[ f(x) = 2 + \sqrt{x^2} \]
\[ f(x) = \sqrt{x} \]
\[ f(x) = (x - 1)^2 + 2x \]

1. Graph each piecewise function.
   a) \[ f(x) = \begin{cases} 
   2, & \text{if } x < 1 \\
   3x, & \text{if } x \geq 1 
   \end{cases} \]
   d) \[ f(x) = \begin{cases} 
   |x + 2|, & \text{if } x \leq -1 \\
   -x^2 + 2, & \text{if } x > -1 
   \end{cases} \]
   b) \[ f(x) = \begin{cases} 
   -2x, & \text{if } x < 0 \\
   x + 4, & \text{if } x \geq 0 
   \end{cases} \]
   e) \[ f(x) = \begin{cases} 
   \sqrt{x}, & \text{if } x < 4 \\
   2^x, & \text{if } x \geq 4 
   \end{cases} \]
   c) \[ f(x) = \begin{cases} 
   |x|, & \text{if } x \leq -2 \\
   -x^2, & \text{if } x > -2 
   \end{cases} \]
   f) \[ f(x) = \begin{cases} 
   \frac{1}{x}, & \text{if } x < 1 \\
   -x, & \text{if } x \geq 1 
   \end{cases} \]
Write an equation for the piecewise defined functions shown in the graph.
For each of the following graphs:

(a) State the domain and range of $f$.
(b) Sketch $f^{-1}$.
(c) State the domain and range of $f^{-1}$. 

![Graph 1](image1)

![Graph 2](image2)

![Graph 3](image3)

![Graph 4](image4)
Answer the following. Assume that $f$ and $g$ are defined for all real numbers.

If $f$ and $g$ are inverse functions, $f(-2) = 3$ and $f(4) = -2$, find $g(-2)$.

If $f$ and $g$ are inverse functions, $f(7) = 10$ and $f(10) = -1$, find $g(10)$.

If $f$ and $g$ are inverse functions, $f(5) = 8$ and $f(9) = 3$, find $g(f(3))$.

If $f$ and $g$ are inverse functions, $f(-1) = 6$ and $f(7) = 8$, find $f(g(6))$. 
Given that \( \log 2 = x \), \( \log 3 = y \) and \( \log 7 = z \), express the following expressions in terms of \( x \), \( y \), and \( z \).

**Expand** the expression using the properties of logs. The word log will be used **repeatedly** in each problem.

26. \( \log_5 3x \)

27. \( \log_2 \frac{x}{5} \)

28. \( \log_{10} xy^2 \)

29. \( \log_4 \frac{xy}{3} \)

30. \( \log_3 x^2yz \)

31. \( \log_5 2x \)

**Condense** the expression using the properties of logs. The word log will be used **once** in each problem.

32. \( \log_3 7 - \log_3 x \)

33. \( 2 \log_5 x + \log_5 3 \)

34. \( \log_4 5 + \log_4 x + \log_4 y \)

35. \( 3 \log_{10} x - \log_{10} 4 \)

36. \( 2 \log_2 x - 3 \log_2 y \)

37. \( \log_3 4 + 2 \log_3 x - \log_3 5 \)

38. \( \log_2 x - 2 \log_5 y \)

39. \( 3 \log_3 2 + \log_3 6 - 2 \log_3 4 \)

Solve for \( x \).

19. \( \log_6 x = 2 \)

20. \( \log_5 x = 3 \)

21. \( \log_{16} x = -1 \)

22. \( \log_9 x = 2 \)

23. \( \log_{1/4} x = -2 \)

24. \( \log_x 64 = 3 \)

25. \( \log_x 8 = -1 \)
1. $15,000 is invested in an account that yields 5% interest per year. After how many years will the account be worth $91,221.04 if the interest is compounded yearly?

2. $8,000 is invested in an account that yields 6% interest per year. After how many years will the account be worth $13709.60 if the interest is compounded monthly?

3. Starting at the age of 40, an average man loses 5% of his hair every year. At what age should an average man expect to have half his hair left?

4. A bacteria culture starts with 1,000 bacteria and doubles every 40 minutes.
   a. Find a formula for the number of bacteria at time t.
   b. Find the number of bacteria after one hour.
   c. After how many minutes will there be 50,000 bacteria?
Solve each equation.

1) \(4^{2x + 3} = 1\)

2) \(5^{3 - 2x} = 5^{-x}\)

Solve each equation algebraically and graphically.

3) \(3^{1 - 2x} = 243\)

4) \(3^{2a} = 3^{-a}\)

5) \(4^{3x - 2} = 1\)

6) \(4^{2p} = 4^{-2p - 1}\)

7) \(6^{-2a} = 6^{2 - 3a}\)

8) \(2^{2x + 2} = 2^{3x}\)

9) \(16^{n - \frac{7}{3}} + 5 = 24\)

10) \(5 \cdot 6^{3m} = 20\)

11) \(3.4e^{2 - 2n} - 9 = -4\)
1. \( \log(x + 2) + \log(x - 1) = 1 \)

2. \( \log_2(x^2 - x - 2) = 2 \)

3. \( \log x + \log(x - 1) = \log(4x) \)

4. \( \log(3x + 5) = 2 \)

5. \( \log_3(x + 15) - \log_3(x - 1) = 2 \)
Find the length of the side labeled $x$. When necessary, round your answer to two decimal places.

15. \[ \begin{array}{c}
25 \\
30^\circ
\end{array} \quad \begin{array}{c}
x
\end{array} \]

16. \[ \begin{array}{c}
12 \\
45^\circ
\end{array} \quad \begin{array}{c}
x
\end{array} \]

17. \[ \begin{array}{c}
x
\end{array} \quad \begin{array}{c}
60^\circ \\
13
\end{array} \]

18. \[ \begin{array}{c}
x
\end{array} \quad \begin{array}{c}
4 \\
30^\circ
\end{array} \]

19. \[ \begin{array}{c}
12 \\
36^\circ
\end{array} \quad \begin{array}{c}
x
\end{array} \]

20. \[ \begin{array}{c}
x
\end{array} \quad \begin{array}{c}
25 \\
53^\circ
\end{array} \]

Find the measure of the indicated angle. When necessary, round your answer to two decimal places.

1) \[ \begin{array}{c}
C \\
B \\
A
\end{array} \quad \begin{array}{c}
12 \\
13
\end{array} \quad \theta \]

2) \[ \begin{array}{c}
A \\
B
\end{array} \quad \begin{array}{c}
C
\end{array} \quad \begin{array}{c}
13 \\
4
\end{array} \quad \theta \]

3) \[ \begin{array}{c}
A \\
B
\end{array} \quad \begin{array}{c}
C
\end{array} \quad \begin{array}{c}
6 \\
10
\end{array} \quad \theta \]

4) \[ \begin{array}{c}
B \\
C
\end{array} \quad \begin{array}{c}
A
\end{array} \quad \begin{array}{c}
11.9 \\
10
\end{array} \quad \theta \]

5) \[ \begin{array}{c}
A \\
B
\end{array} \quad \begin{array}{c}
C
\end{array} \quad \begin{array}{c}
7.7 \\
14
\end{array} \quad \theta \]

6) \[ \begin{array}{c}
B \\
C
\end{array} \quad \begin{array}{c}
A
\end{array} \quad \begin{array}{c}
4 \\
5
\end{array} \quad \theta \]
Simplify each expression

1. \( \frac{y^2 + y}{y^2 - 1} \)

2. \( \frac{1-x^2}{x^3 - 1} \)

3. \( \frac{y^2 - 3y - 18}{2y^2 + 7y + 3} \)

4. \( \frac{2x^3 - x^2 - 6x}{2x^2 - 7x + 6} \)

Simplify the compound fraction

1. \( \frac{1 + \frac{1}{x}}{x - 2} \)

2. \( \frac{\frac{1}{x-1} + \frac{1}{x+3}}{x+1} \)

3. \( \frac{x^3}{x+1} \cdot \frac{x}{x^2 + 2x + 1} \)

4. \( \frac{2x^2 - 3x - 2}{x^2 - 1} \cdot \frac{x^2 + 5x + 2}{x^2 + x - 2} \)
Simplify each expression:

\[ \sqrt{15}(2\sqrt{10} - 4\sqrt{6}) \]

\[ (\sqrt{2a} - 5)(7\sqrt{2a} - 5) \]

\[ (\sqrt{3} + \sqrt{5x})(\sqrt{3} - 5\sqrt{5x}) \]

\[ (-7 + \sqrt{3x})(4 + \sqrt{3x}) \]

\[ (2 + \sqrt{5})(-2 + \sqrt{5k}) \]