Test #3

1. Perform the indicated function compositions using the following formulas:
   \[ f(x) = x + 1 \quad g(x) = x^3 - 1 \]
   \[
   (g \circ f)(x) = \\
   (g \circ f \circ f)(0) =
   \]

2. Perform the following function composition and find the domain of the result:
   \[ f(x) = \frac{1}{x^2 - 9} \quad g(x) = \sqrt{x - 1} \]
   \[
   (f \circ g)(x) = \\
   \text{Domain:}
   \]

3. Find the inverse of the following function:
   \[ f(x) = \sqrt{20 - 2x} \]
   \[
   f^{-1}(x) = \\
   \text{Domain:}
   \]
4. Use a table of values to help you graph the following exponential and logarithm:

\[ y = 3^x \quad y = \log_3 x \quad y = \log_3 (x + 2) - 1 \]

<table>
<thead>
<tr>
<th>x \quad</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td></td>
</tr>
</tbody>
</table>

5. Solve the following exponential equations:

\[ 9^{1-x} = 27^x \quad 2^x \cdot 2^{x+3} = \frac{1}{8} \]

6. Solve the following logarithm equations:

\[ \log_5 (3x + 2) = 2 \quad \ln(2x + 3) = 4 \]
7. Find the exact value of the following:

\[
\log_7 49 = \quad \ln 1 = \quad \log_2 \frac{1}{\sqrt{2}} =
\]

8. Combine the following into a single logarithm by using the logarithm rules:

\[
2 \log_5 A - 4 \log_5 B - 7 \log_5 C + \frac{1}{2} \log_5 D =
\]

Solve for \( x \):

9. \( \log_2 x + \log_2 (x - 7) = 3 \)

10. \( \log x - \log(x - 2) = 2 \)

11. \( 3^{2x} - 3^{x+1} - 10 = 0 \)

12. \( \pi^{1-x} = 5^{x+3} \)