7.4 and 7.5 Worksheet

<table>
<thead>
<tr>
<th>Property</th>
<th>Definition</th>
<th>Example</th>
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<tbody>
<tr>
<td>Product</td>
<td>( \log_b mn = \log_b m + \log_b n )</td>
<td>( \log_3 9x = \log_3 9 + \log_3 x )</td>
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<tr>
<td>Quotient</td>
<td>( \log_b \frac{m}{n} = \log_b m - \log_b n )</td>
<td>( \log_\frac{4}{5} = \log_\frac{4}{4} 4 - \log_\frac{4}{4} 5 )</td>
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<tr>
<td>Power</td>
<td>( \log_b m^p = p \cdot \log_b m )</td>
<td>( \log_2 8^x = x \cdot \log_2 8 )</td>
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<tr>
<td>Equality</td>
<td>If ( \log_b m = \log_b n ), then ( m = n ).</td>
<td>( \log_8 (3x - 4) = \log_8 (5x + 2) ) so, ( 3x - 4 = 5x + 2 )</td>
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In #1-8, evaluate the logarithm without a calculator (show work):

1. \( \log_3 81 \)
2. \( \log_8 1 \)
3. \( \log_3 (\sqrt[3]{3}) \)
4. \( \log_{27} 3 \)

5. \( \log_{27} 9 \)
6. \( \log_8 4 \)
7. \( \log_2 (\frac{1}{16}) \)
8. \( \log_{25} 125 \)

9. Use \( \log 4 \approx 0.6 \) and \( \log 7 \approx 0.8 \) to evaluate: (no calculator)
   a) \( \log 28 \)
   b) \( \log \frac{7}{4} \)
   c) \( \log 16 \)

d) \( \log 40 \)

e) \( \log \frac{1}{4} \)

f) \( \log 700 \)
10. Match the expression with the logarithm that has the same value (show simplifying work):

   a) \( \log \sqrt{2} + \log \sqrt{8} \)  
   i. \( \log \frac{2}{5} \)

   b) \( \log 4 - \log 10 \)  
   ii. \( \log 27 \)

   c) \( 2\log 4 - \log 2 \)  
   iii. \( \log 4 \)

   d) \( -3\log \left(\frac{1}{3}\right) \)  
   iv. \( \log 8 \)

11. Expand the expression using log properties (and simplify where possible):

   a) \( \log_2 \left( \frac{\sqrt{2x}}{2} \right) = \)

   b) \( \log_9 (2x^2 y) = \)

12. Use properties of logs to condense the expression:

   a) \( \log 3 + \frac{1}{2} \log x - \log 5 = \)

   b) \( 2\log x - \log(x+4) = \)
You may use a calculator on the following problems. Show all algebraic work.

13. You deposit $500 in an account that pays 3.25% annual interest compounded monthly. How much money will you have after 5 years?

14. You deposit $700 in an account that pays 2.75% compounded continuously. How much money will you have after 3 years?

15. Sketch the following graphs.
   a) \( y = \log_2 x \)
   b) \( y = \log_3 (x + 4) \)

   ![Graph of a) \( y = \log_2 x \)]
   ![Graph of b) \( y = \log_3 (x + 4) \)]

   domain: ____________
   domain: ____________

   range: ____________
   range: ____________

   asymptote: ____________
   asymptote: ____________

   x-int: ____________
   x-int: ____________