1. Simplify the expression \( \frac{|2-x|}{x-2} \) if \( x > 2 \).

2. Find all solutions to the equation \( 2^{x^2 - 2x} = 8 \).

3. Find the domain of \( f(x) = \frac{\ln(x)}{x-2} \). Write your answer in interval notation.

4. Solve the inequality \( \frac{3x + 6}{x(x-4)} \leq 0 \). Write your answer in interval notation.

5. An account in a certain bank pays 5% annual interest, compounded continuously. An initial deposit of $200 is made into the account. How many years does it take for the $200 to double? **You must write an exact answer in terms of logarithms.**

6. For each part, calculate the limit or show that it does not exist.
   
   (a) \( \lim_{x \to 0} \left( \frac{\sin(5x)}{3x} \cos(4x) \right) \)
   
   (b) \( \lim_{x \to -2} \left( \frac{x^2 + 3x + 2}{x^2 + x - 2} \right) \)
   
   (c) \( \lim_{x \to 0} \left( \frac{1}{x} - \frac{1}{x^2 + x} \right) \)

7. For each part, calculate \( f'(x) \). Do not simplify your answer after computing the derivative.

   (a) \( f(x) = \frac{\tan(x)}{\pi - \sec(x)} \)

   (b) \( f(x) = \cos(e^{-3x}) \)

   (c) \( f(x) = \sqrt{\ln(x^2 + 4) + x \sin(2x)} \)

   (d) \( f(x) = \frac{e^{1/x}}{x^{2/3} + x^{1/3}} \)

8. The graph of \( f(x) \) is given below. Find all values of \( x \) in the interval \((-4, 4)\) for which \( f \) is not continuous.

![Graph of f(x)](image)

9. Some values of \( g, h, g', \) and \( h' \) are given below. Use this table to answer parts (a) and (b).

<table>
<thead>
<tr>
<th>( x )</th>
<th>( g(x) )</th>
<th>( g'(x) )</th>
<th>( h(x) )</th>
<th>( h'(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>-3</td>
<td>-9</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>-1</td>
<td>1</td>
<td>-6</td>
</tr>
</tbody>
</table>

(a) Let \( f(x) = 3g(x)h(x) \). Calculate \( f'(2) \).

(b) Let \( F(x) = g(\sqrt{x}) \). Calculate \( F'(4) \).
10. Find an equation of the line normal to the graph of \( f(x) = 2x^2 - \ln(x) + 3 \) at \( x = 1 \). (Recall that the normal line is perpendicular to the tangent line.)

11. Let \( f(x) = 3\sqrt{x} \). Use the limit definition of the derivative to find \( f'(x) \). Show all work.

12. Find the values of the constants \( a \) and \( b \) that make \( f \) continuous at \( x = 9 \).

\[
 f(x) = \begin{cases} 
 \sin(2\pi x) - 2ax & , \ x < 9 \\
 b & , \ x = 9 \\
 \frac{x - 9}{\sqrt{x} - 3} & , \ x > 9 
\end{cases}
\]

You must use proper calculus and notation to give a complete and clear justification for your answer.

13. Find the \( x \)-coordinate of each point on the graph of \( y = \frac{1}{\sqrt{x}}(x^3 + 15) \) where the tangent line is perpendicular to the line \( x + 5y = 1 \).