Calculus I Exam 1 Review (Ch. 1)

Review problems from pp. 70-72: Be familiar with the concepts on p. 70 1-13, 16-18; work the following exercises from pp. 71-72: 1-5, 7, 8, 15, 19, 20, 22-24, 26, 29-32, 34, 45, 47, plus the problems below. In addition to the problems listed from the chapter review and these 15 problems, all of your homework problems are fair game for the test as well. Please be sure to have your homework (1.1-1.6) completed and ready to hand in on Thursday.

1. Write the equation of a line with slope ½ containing the point (-4, 5).

2. You place a frozen pie in the oven and bake it for an hour. Then you take it out and let it cool before eating it. Sketch a graph of the temperature of the pie as a function of time.

3. State the domain of each of the following functions in interval notation. Then label each function as even, odd, or neither.
   a) \( f(x) = |x| - 5 \)  
   b) \( f(x) = \sqrt{x^2 + 6x + 8} \)  
   c) \( f(x) = \frac{x}{x^2 - 16} \)

4. If \( f(x) = 7 - 5x - x^2 \), find the following and simplify if possible.
   a) \( f(3) \)  
   b) \( f(x + h) \)  
   c) \( \frac{f(x+h) - f(x)}{h} \)
5. Graph the piecewise function and use it to evaluate each limit, if it exists.

\[ f(x) = \begin{cases} 
  x^2 - 4, & \text{if } x \leq 0 \\
  3x + 2, & \text{if } x > 0 
\end{cases} \]

\( a) \ \lim_{x \to 0^+} f(x) \)

\( b) \ \lim_{x \to 0^-} f(x) \)

\( c) \ \lim_{x \to 0} f(x) \)

6. Suppose the graph of \( f(x) \) is given. Write equations for the graphs that are obtained from the graph of \( f(x) \) as follows.

a) Shift 7 units up and 3 units right

b) Reflect across the \( y \)-axis and horizontally compress by a factor of 4

7. Given \( f(x) = \frac{2}{x} \) and \( g(x) = \sqrt{3x + 6} \), find (in simplified form) each of the following and state their domains.

a) \( f + g \)  
b) \( fg \)  
c) \( \frac{f}{g} \)

d) \( f \circ g \)  
e) \( g \circ f \)  
f) \( f \circ f \)

8. Suppose the position of an object at time \( t \) seconds is given in feet by the function \( s = 3t^2 \). Determine the average velocity of the object on the interval \([2, 5]\).
9. Given that \( \lim_{x \to 2} f(x) = 9 \), \( \lim_{x \to 2} g(x) = -4 \), and \( \lim_{x \to 2} h(x) = 0 \), find each of the following, if they exist.

(a) \( \lim_{x \to 2} [f(x) + 5g(x)] \)  
(b) \( \lim_{x \to 2} [g(x)]^3 \)

(c) \( \lim_{x \to 2} \sqrt{f(x)} \)  
(d) \( \lim_{x \to 2} \frac{3f(x)}{g(x)} \)

(e) \( \lim_{x \to 2} \frac{g(x)}{h(x)} \)  
(f) \( \lim_{x \to 2} \frac{g(x)h(x)}{f(x)} \)

Evaluate each limit, if it exists. Justify your answers algebraically.

10. \( \lim_{x \to 2} \frac{x^2 - 9x + 14}{x^2 - 4} \)  
11. \( \lim_{x \to 4} \left( \frac{\sqrt{x^2 + 9} - 5}{x - 4} \right) \)

12. \( \lim_{h \to 0} \frac{(h+4)^2 - 16}{h} \)  
13. \( \lim_{x \to -3} \frac{1 + \frac{1}{x}}{x + 3} \)

14. Estimate the following limit numerically by completing the given table.

\[ \lim_{x \to 1} \frac{x^6 - 1}{x^8 - 1} \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>0.9</th>
<th>0.99</th>
<th>0.999</th>
<th>0.9999</th>
<th>1.1</th>
<th>1.01</th>
<th>1.001</th>
<th>1.0001</th>
</tr>
</thead>
<tbody>
<tr>
<td>( x^6 - 1 )</td>
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</table>
15. Sketch the graph of a function which satisfies the following conditions: It has a removable discontinuity at $x = -2$, it has a jump discontinuity at $x = 1$, but is continuous from the right at $x = 1$, and it has an infinite discontinuity at $x = 4$.

Make sure you do the suggested review problems from the book, as everything which is on the test is not covered in these 15 problems!