MT-A142-06  Exam One  Fall 2002

You may keep this page of questions. Turn in your answers with all of your work on the pink paper and lime colored paper. You are NOT allowed to use calculators on questions #1 – 5. Work these questions on the pink paper. After you have finished these first five questions, turn in the first part of the exam and receive a page of lime colored paper to use for the two calculator questions.

(1) 12 Points. Find a possible formula for the graph shown to the right.

(2) 18 Points. Find exact values for the following limits. This is NOT a calculator problem.

   (a) \( \lim_{x \to 1^+} \frac{x^2 - 1}{x^2 + 5x - 6} \)
   (b) \( \lim_{x \to \infty} \frac{2x^2 + x - 3}{3x^2 - 4x - 4} \)
   (c) \( \lim_{x \to 1^+} \frac{x - 3}{x - 1} \)

(3) 10 Points. The table below shows some values of a linear function \( f \) and an exponential function \( g \). Find exact values (not decimal approximations) for each of the missing entries.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( -1 )</th>
<th>( 0 )</th>
<th>( 1 )</th>
<th>( 2 )</th>
<th>( 3 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>?</td>
<td>?</td>
<td>5</td>
<td>?</td>
<td>45</td>
</tr>
<tr>
<td>( g(x) )</td>
<td>?</td>
<td>?</td>
<td>5</td>
<td>?</td>
<td>45</td>
</tr>
</tbody>
</table>

(4) 24 Points.
(a) Sketch a graph of \( y = f(x) \) if \( f(x) = \begin{cases} 3 + (x + 1)^2 & \text{if } x \geq -1 \\ \text{undefined} & \text{otherwise} \end{cases} \)
(b) Find the domain and the range for \( f \).
(c) Sketch a graph of \( f^{-1}(x) \).
(d) Find a formula for \( f^{-1}(x) \).
(5) 16 Points.
(a) State the definition for the derivative function \( f'(x) \) of a function \( f(x) \).

(b) Use the definition of the derivative to compute \( f'(x) \) if \( f(x) = \frac{x}{3x + 2} \).

SHOW YOUR WORK!

Turn in the above work on the pink paper and receive lime paper to use for the last two questions.

(6) 10 Points. What is the doubling time of prices which are increasing by 3.17\% a year?

(7) 10 Points. Use your calculator to numerically approximate the value of

\[
\lim_{x \to 1} \frac{x^2 5^x - 5}{2 - \sqrt{3} + x^2}
\]

For full credit your approximation for this limit should be accurate to the nearest thousandth. For partial credit, you should show enough of your work that I can follow your reasoning or else you should explain how you arrived at your answer.