Worksheet 1 Numerics

In this worksheet you will explore how stepsize and Taylor polynomial degree affect the quality of an approximation. All questions use Taylor polynomials for $e^x$ centered on $x = 0$.

Do this worksheet along with WebAssign Problem 7. All questions refer to the table below. The final result should be a cleanly completed table with some entries deliberately left blank.

<table>
<thead>
<tr>
<th>degree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e^{1.0}$</td>
<td>2.5000</td>
<td>2.6667</td>
<td>2.7083</td>
<td>2.7167</td>
<td>2.7181</td>
<td>2.7183</td>
<td>No Change</td>
</tr>
<tr>
<td>$e^{0.5}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$e^{0.2}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$e^{0.1}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$e^{0.05}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. The numerical entries in the row for $e^{1.0}$ are from WebAssign Problem 4. Compare them to your answers. Why does the degree 8 cell say “No Change”? 

2. Look up your answers to WebAssign Problem 5. Use your answers to fill in the row for $e^{0.5}$.
   - Write all numerical answers exact to 4 decimal places.
   - Write “No Change” in the appropriate cell.
   - All cells to the right of “No Change” should be left blank.

3. When you are done with this row, answer parts (a)–(c) of WebAssign Problem 7.
   Warning! Limited submissions.

4. If your answers to the WebAssign questions exposed errors in your table, fix your table. Print a clean copy if necessary. You will want a clean table for upcoming problems.
5. From your answer to WebAssign Problem 3(c), write only the quadratic portion of $T_5(x)$.

$$T_2(x) = \frac{1}{2} x^2$$

6. Use this to fill in the first cell of the row for $e^{0.2}$.

7. Use a similar approach to complete the rest of the row.

8. When you are done with this row, answer parts (d)–(f) of WebAssign Problem 7.

   **Warning!** Limited submissions.

9. Clean up your table if necessary.

10. Complete the table.

11. Answer the rest of the WebAssign Problem 7.

12. Clean up your table if necessary.

13. Keep your clean and complete table nearby. You will need it for future problems.