Remember that final answers are not as important as how you get there. Show all your steps clearly so you will be eligible for the most partial credit. Simplify arithmetic quantities completely. Good luck!

1.) (10 pts.) Given \( f(x) = x^4 - 4x^3 - 8x^2 + 1 \) on the interval \([-5, 5]\), use calculus to find all the local maxima, local minima, and points of inflection. Sketch the curve, indicating each local maximum, local minimum, and inflection point you have found.
2.) (10 pts.) What does the Extreme Value Theorem allow us to conclude about a function \( f \) if \( f \) is continuous on \([0, 100]\)?

3.) (10 pts.) Using the figures below, draw rectangles representing each of the following sums for the function \( f \) in the interval \( 0 \leq t \leq 12 \). Calculate the value of each sum.

Left-hand sum with \( \Delta t = 3 \)  
Right-hand sum with \( \Delta t = 3 \)

Left-hand sum with \( \Delta t = 6 \)  
Right-hand sum with \( \Delta t = 6 \)
4.) (10 pts.) Find the average value of the function over the given interval:

a.) \( h(x) = 2x + 2 \) over \([1, 3]\)

b.) \( f(x) = e^{2x} \) over \([0, 10]\).

5.) (10 pts.) A landscape architect plans to enclose a 3000 square-foot rectangular region in a botanical garden. She will use shrubs costing $25 per foot along three sides and fencing costing $20 per foot along the fourth side. Find the dimensions that minimize the total cost.
6.) (10 pts.) Sketch the graph of a function with two local minima, no global maximum, and one global minimum.

7.) (10 pts.) Use the table to estimate $\int_{0}^{50} f(x)dx$. What values of $n$ and $\Delta x$ did you use?

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>30</td>
<td>35</td>
<td>45</td>
<td>50</td>
<td>70</td>
<td>85</td>
</tr>
</tbody>
</table>

8.) (10 pts.) Evaluate $\int_{0}^{2} 4x^3 dx$ using the Fundamental Theorem of Calculus.
9.) (10 pts.) Suppose \( \int_a^b g(x) \, dx = 5 \), \( \int_a^b (g(x))^2 \, dx = 8 \), \( \int_a^b h(x) \, dx = 1 \), and \( \int_a^b (h(x))^2 \, dx = 4 \). Find the integrals:

   a.) \( \int_a^b \left( (g(x))^2 - (h(x))^2 \right) \, dx \)
   
   b.) \( \int_a^b g(x) \, dx - \left( \int_a^b (2h(x)) \, dx \right)^2 \)

10.) (10 pts.) For \( f(x) = 2 \cos^2 x - \sin x \) and \( 0 \leq x \leq \pi \), use calculus to find the value(s) of \( x \) for which \( f(x) \) has a global maximum or global minimum.

**BONUS:** (2 pts.) In what way has the movie *Speed* impacted your mathematical and intellectual life? How would you have answered differently if someone had asked you this question three months ago?