1. a) Find the absolute max and absolute min of \( f(x) = x^4 - 4x^3 \) on \([-1, 4]\).

b) Does \( f(x) \) above have an absolute max on \((-1, 3)]\? Why or why not?

2. Given that \( f''(x) \) is continuous and the table of values below, what can be concluded at each \( x \) value?

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f'(x) )</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>( f''(x) )</td>
<td>0</td>
<td>-1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

3. A triangle has vertices \((0, 0), (2, 0), \) and \((0, 5)\). Find the dimensions of the rectangle of maximum area that can be inscribed in the triangle. Assume one side lies on the x-axis.

4. Find the right hand Riemann sum with \( n = 3 \) for \( f(x) = x^2 \) on \([0, 2]\).

5. An object travels in a straight line with velocity \( v(t) = \begin{cases} \sqrt{9 - t^2} & 0 \leq t \leq 3 \\ 18 - 6t & 3 < t \end{cases} \)

Assume \( s(0)=0 \). a) Find \( s(5) \). Find the total distance traveled in the first 5 seconds.

6. Evaluate using geometry or symmetry.

   a) \( \int_{-5}^{0} (\sqrt{25 - x^2} + 3x) \, dx \)
   
   b) \( \int_{-\pi}^{\pi} \sin^3 x \, dx \)

7. Find \( f(t) \) if \( f''(t) = 6t^2 + e^t \), \( f(0) = 3 \), \( f(1) = 3 + e \).

8. Find each antiderivative.

   a) \( \int \sqrt{\ln t} \, dt \)
   
   b) \( \int (t - 2) \sqrt{t + 2} \, dt \)
9. Evaluate each definite integral.

\[ \int_{0}^{\sqrt{5}} 3x\sqrt{x^2 + 4} \, dx \]

\[ \int_{0}^{1} (x^2 - 6x)e^{x^3 - 9x^2} \, dx \]

\[ \int_{0}^{\pi/2} \frac{\sin x}{(1 + \cos x)^2} \, dx \]

\[ \int_{0}^{\pi/4} \tan x \sec^2 x \, dx \]

9d can be done two ways. The antiderivatives differ only by a constant.

\[ \int_{1}^{e^2} \frac{(\ln x)^3}{x} \, dx \]

\[ \int_{2}^{5} \frac{1}{x \ln x} \, dx \]