1990 AB5

Let \( f \) be the function defined by \( f(x) = \sin^4 x - \sin x \) for \( 0 \leq x \leq \frac{3\pi}{2} \).

(a) Find the x-intercepts of the graph of \( f \).

(b) Find the intervals on which \( f \) is increasing.

(c) Find the absolute maximum value and the absolute minimum value of \( f \). Justify your answer.

1989 BC3

Consider the function \( f \) defined by \( f(x) = e^x \cos x \) with domain \( [0, 2\pi] \).

(a) Find the absolute maximum and minimum values of \( f(x) \).

(b) Find the intervals on which \( f \) is increasing.

(c) Find the x-coordinate of each point of inflection of the graph of \( f \).

1989 AB1

Let \( f \) be the function given by \( f(x) = x^3 - 7x + 6 \).

(a) Find the zeros of \( f \).

(b) Write an equation of the line tangent to the graph of \( f \) at \( x = -1 \).

(c) Find the number \( c \) that satisfies the conclusion of the Mean Value Theorem for \( f \) on the closed interval \( [1, 3] \).
1994 AB 1

Let \( f \) be the function given by \( f(x) = 3x^4 + x^3 - 21x^2 \).

(a) Write an equation of the line tangent to the graph of \( f \) at the point \( (2, -28) \).

(b) Find the absolute minimum value of \( f \). Show the analysis that leads to your conclusion.

(c) Find the \( x \)-coordinate of each point of inflection on the graph of \( f \). Show the analysis that leads to your conclusion.

1993 AB4/BC3

Let \( f \) be the function defined by \( f(x) = \ln(2 + \sin x) \) for \( \pi \leq x \leq 2\pi \).

(a) Find the absolute maximum value and the absolute minimum value of \( f \). Show the analysis that leads to your conclusion.

(b) Find the \( x \)-coordinate of each inflection point on the graph of \( f \). Justify your answer.

If \( f \) is continuous on \([0, 3]\) and satisfies the following:

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>0 &lt; ( x &lt; 1 )</th>
<th>1</th>
<th>1 &lt; ( x &lt; 2 )</th>
<th>2</th>
<th>2 &lt; ( x &lt; 3 )</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>0</td>
<td>+</td>
<td>2</td>
<td>+</td>
<td>0</td>
<td>-</td>
<td>-2</td>
</tr>
<tr>
<td>( f'(x) )</td>
<td>3</td>
<td>+</td>
<td>0</td>
<td>-</td>
<td>DNE</td>
<td>-</td>
<td>-3</td>
</tr>
<tr>
<td>( f''(x) )</td>
<td>0</td>
<td>-</td>
<td>-1</td>
<td>-</td>
<td>DNE</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

a) Find the absolute extrema of \( f \) and where they occur. Justify your response.

b) Find any points of inflection. Justify your response.