1. **(25 POINTS)** The position of a particle is given by \( s(t) = t^3 - 12t^2 + 36t \), where \( t \geq 0 \) is measured in seconds and \( s \) is measured in feet. Include units in your answers where appropriate.

(a) Find the velocity at time \( t \).
(b) What is the velocity after 3 seconds?
(c) When is the particle at rest?
(d) When is the particle moving in the positive direction?
(e) Find the total distance traveled by the particle during the first 5 seconds.
(f) When is the acceleration zero?

2. **(20 POINTS)** Consider the curve with equation \( y^2 = x^3 + 3x^2 \). You must use implicit differentiation to solve this problem.

(a) Find an equation of the tangent line to this curve at the point \((-1, 2)\). Write your answer in the form \( y = mx + b \).
(b) Find \( y'' \).
(c) At what points does this curve have a horizontal tangent line?

3. **(10 POINTS)** Find \( \frac{dy}{dx} \) given the curve \( \sin(x + y) = y^2 \cos(x) \).

4. **(25 POINTS)** A man stands at point \( A \). A spotlight sits at point \( B \), 20 ft south of point \( A \), and is shining on the man. The man walks east along a straight path at a speed of 4 ft/s, and the spotlight rotates so that it keeps shining on the man. At what rate is the spotlight rotating when the man is 15 ft from point \( A \)? Include a picture in your solution and include units in your answer.

5. **(20 POINTS)** A table of values for \( f \), \( g \), \( f' \) and \( g' \) is given. Please answer the questions below. Simplify your answers as far as possible and show every step.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
<th>( f'(x) )</th>
<th>( g(x) )</th>
<th>( g'(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>6</td>
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</tr>
<tr>
<td>3</td>
<td>7</td>
<td>2</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

(a) If \( h(x) = f(x)g(x) \), find \( h'(3) \) 
(b) If \( H(x) = \sqrt{7 + 2f(x)} \), find \( H'(2) \)
(c) If \( R(x) = \frac{x^2}{g(x)} \), find \( \frac{dR}{dx} \bigg|_{x=2} \)
(d) If \( F(x) = g(\sqrt{x}) \), find \( F'(1) \)