1. (a) \( P(w, y) = -w^2 + 2wy - 3y^2 + 26w + 38y - 130 \)
   (b) \( w = 29, y = 16 \)
   (c) selling one additional Yodget
   (d) 40.75

2. (a) \( \frac{dy}{dx} = (4x + \ln x)^3 \left[ 7 \left( 5\sqrt{x} - \frac{1}{x} \right)^6 \left( \frac{5}{2} x^{-1/2} + x^{-2} \right) \right] + \left( 5\sqrt{x} - \frac{1}{x} \right)^7 \left[ 3 \left( 4x + \ln x \right)^2 \left( 4 + \frac{1}{x} \right) \right] \)
   (b) \( \frac{9}{10} \ln x + 21x^{1/3} + C \)
   (c) 15,972.64
   (d) \( R_x(x, y) = \frac{(xy^5 + x^6)(3e^{3x})(y^2 - 3) - e^{3x}(y^2 - 3)(y^5 + 6x^5)}{(xy^5 + x^6)^2} \)
   (e) 348.5
   (f) 250

3. (a) \( t = 17 \) seconds
   (b) \( 400 - 11t - 5.5h \)
   (c) \( G'(t) = \frac{113.4}{(t + 1)^2} \)
   (d) ii. The gray car is always getting slower. \( G''(t) = -\frac{126.8}{(t + 1)^3} \), which is negative at all positive \( t \), and this implies that \( G'(t) \) is always decreasing.

4. $564.57

5. (a)

<table>
<thead>
<tr>
<th>( r'(x) &gt; 0 ) and ( r''(x) &gt; 0 )</th>
<th>ANSWER</th>
<th>( F )</th>
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<tbody>
<tr>
<td>( r'(x) = 0 ) and ( r''(x) &gt; 0 )</td>
<td>E, H</td>
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<td>( r'(x) &lt; 0 ) and ( r''(x) &lt; 0 )</td>
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<td>( r'(x) &gt; 0 ) and ( r''(x) &lt; 0 )</td>
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<td>( r'(x) = 0 ) and ( r''(x) &lt; 0 )</td>
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<td>( r'(x) = 0 ) and ( r''(x) = 0 )</td>
<td>J</td>
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</tr>
<tr>
<td>( r'(x) &lt; 0 ) and ( r''(x) &gt; 0 )</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

(b) local max at \( m = 14, 24 \); local min at \( m = 17 \)

6. (a) from \( t = 3 \) to \( t = 15 \) hours
   (b) local maximum at \( t = 25 \) hours; local minimum at \( t = 3 \) hours
   (c) 6 feet
   (d) 4631
   (e) $-290; The balloon falls 290 feet during the first 2 hours.