Homework Set 2

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Problem 1

- The aerodynamic drag on a car is given by

\[ F_D = \frac{1}{2} \rho C_D A V^2 \]

- \( \rho \) is air density (1.2 kg/m³), \( A \) is projected area, and \( V \) is velocity.

- Fit this data to the function to determine the product \( C_D A \)

<table>
<thead>
<tr>
<th>( V ) (km/h)</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>140</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>( F_D ) (N)</td>
<td>10</td>
<td>50</td>
<td>109</td>
<td>180</td>
<td>300</td>
<td>420</td>
<td>565</td>
<td>771</td>
</tr>
</tbody>
</table>
Problem 2

A paper cup, shaped as a frustum of a cone, with $R_2 = 1.3R_1$, holds $240 \text{ cm}^3$ of liquid. Determine $R_1$ and $h$ such that the amount of paper needed to make the cup is a minimum.
Problem 3

- Fit the US Census data from 1900 to 2000 to an 8\textsuperscript{th} order polynomial.
- When does this approach predict the US population will reach zero!