1. If the State of Michigan and the Federal Government increase gas tax by 5 cents each. Assume all other amounts remain the same as FY 2000 numbers.
   a. Explain how it might impact the highway trust fund. What would be the additional amounts that may be available for highway funding?
   b. If the city of Detroit has 75% local roadways, 12% collectors and 13% principal arterials and freeways, explain how the increase in gas tax will impact road projects in the city.
   Substantiate all explanations with numbers.
   (refer slide handouts from class, for more information if required, check the website provided in class)

2. Write in about 350 words how transportation impacts on the environment can be reduced. Include the following:
   a. Identify and describe 3 specific impacts (e.g. greenhouse gases)
   b. Describe how federal government, local government, employers and motoring public in general can help reduce these transportation impacts on the environment.

3. The following table shows the percent growth in population and in auto ownership for each state during the 1980-1990 era. Conduct regression analysis between population (X) and auto-ownership (Y).
   a. Perform all calculations manually
   b. Run regression analysis using Microsoft Excel program.
   c. Explain the significance of all the calculated parameters (e.g standard error, \( R^2 \), etc.)

<table>
<thead>
<tr>
<th>STATE</th>
<th>% Change in population</th>
<th>% Change in Auto Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>2.8</td>
<td>-8.01</td>
</tr>
<tr>
<td>Connecticut</td>
<td>5.8</td>
<td>24.45</td>
</tr>
<tr>
<td>Florida</td>
<td>32.8</td>
<td>51.46</td>
</tr>
<tr>
<td>Iowa</td>
<td>-4.7</td>
<td>11.59</td>
</tr>
<tr>
<td>Maryland</td>
<td>13.4</td>
<td>27.72</td>
</tr>
<tr>
<td>Montana</td>
<td>1.5</td>
<td>11.47</td>
</tr>
<tr>
<td>Ohio</td>
<td>0.5</td>
<td>20.85</td>
</tr>
<tr>
<td>Texas</td>
<td>19.4</td>
<td>21.32</td>
</tr>
<tr>
<td>Virginia</td>
<td>15.7</td>
<td>37.4</td>
</tr>
<tr>
<td>West Virginia</td>
<td>-8.1</td>
<td>-7.42</td>
</tr>
</tbody>
</table>

Note: Late submissions will be penalized 20% per week.
\[
\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i, \quad \bar{y} = \frac{1}{n} \sum_{i=1}^{n} y_i
\]

\[
S_{XX} = \sum_{i=1}^{n} (x_i - \bar{x})^2, \quad S_{YY} = \sum_{i=1}^{n} (y_i - \bar{y})^2
\]

\[
S_{XY} = \sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y}), \quad S_{Y|x} = \sqrt{\frac{S_{YY} - S_{XY}^2}{S_{XY}}}
\]

\[
b_0 = \bar{y} - b_1 \bar{x}, \quad b_1 = \frac{S_{XY}}{S_{XX}}
\]

\[
\text{standard error of coefficient estimate } b_1 = \frac{S_{Y|x}}{\sqrt{S_{XX}}}
\]

\[
r^2 = \frac{S_{XY}^2}{S_{XX} \cdot S_{YY}} = \frac{\text{regression } SS}{\text{total } SS} = \frac{1 - \text{error } SS}{\text{total } SS}
\]

4. Provide a summary of land use models and explain what model you would use if you were the transportation planner for SEMCOG.

5. Solve the Gravity Model problem 7.6 from the textbook (Dickey)