Lab 1: Group Exercises

Group Problem:

1. Consider the bridge, below. It has the absolute minimum number of members that a 2017 Steel Bridge could have. How many members does it have?

Given:
The bridge consists of “built-up” open-web girder sections. The girder sections are 5.5 inches deep, made out of 1”x1” hollow tubes.

How many members? ________________________________

2. Construction Cost Estimating. A CE311 rule of thumb is that the best teams are able to construct their bridge with 2-person-minutes per member. This is a critical, yet simple way of estimating costs and making rational decisions. Based on this rule-of-thumb, what is the estimated Construction Economy (Cost) of the bridge shown?

Construction Economy: ________________________________
Lab 1: Group Exercises

Shears, Moments, and Deflections

1. SIMPLE BEAM — UNIFORMLY DISTRIBUTED LOAD

<table>
<thead>
<tr>
<th>Shear</th>
<th>Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R = V$</td>
<td>$M = \frac{w}{2}$</td>
</tr>
<tr>
<td>$V_x$</td>
<td>$M_{\text{max}}$ (at center)</td>
</tr>
<tr>
<td>$w$</td>
<td>$\frac{w^2}{8}$</td>
</tr>
<tr>
<td>$\frac{w}{2}(1-x)$</td>
<td>$\Delta_{\text{max}}$ (at center)</td>
</tr>
<tr>
<td>$\frac{wx}{24EI}(3 - 2x^2 + x^2)$</td>
<td></td>
</tr>
</tbody>
</table>

Group Problem:
Determine the midspan deflection of the truss.

Given:
- Steel ($E=29000\text{ksi} = 29000000\text{psi}$)
- ¾” square tubes with 1/16” wall thickness
- Total load is 500 lbs, but it is distributed to two planar trusses, over a length of 180”
- 31” dimension is to the centroids of the ¾” top and bottom tubes

Hint: Be careful with units.