1. For the beam we looked at today in class (W 16 x 48, blah, blah, ...) determine the maximum bracing length \( L_u \) for which there is no reduction in the flexural capacity due to Lateral Torsional Buckling.

Hint: set \( M_{\text{flex}} \), allow = \( F_y S / 1.6 = M_{\text{critical}} / 1.6 \) and solve for \( L \).

Use the section properties we used in class.

\[ \text{From class: } \quad W16 \times 50 \quad F_y = 36 \text{ ksi} \]

\[ I_x = 659 \text{ in}^4 \]
\[ I_y = 37.2 \text{ in}^4 \]
\[ S_x = 81.0 \text{ in}^4 \]
\[ G = 11.2 \times 10^6 \text{ psi} \]
\[ J = 1.52 \text{ in}^4 \]

Flexural capacity / \( F_o s \) = \( 36,000 \times \frac{15}{1.52 \text{ in}^4} (\frac{81.0 \text{ in}^3}{1\text{ in}^2}) / 1.6 \)

\[ = 2,916,000 \text{ lb in} = 1,822,500 \text{ lb in} \]

Buckling capacity / \( F_o s \) =

\[ \frac{29 \times 10^6 \text{ lb}}{15} (37.2 \text{ in}^4) \times 11.2 \times 10^6 \times 1.52 \text{ in}^4 \]

\[ = \frac{135,500,000 \text{ lb in}^2}{1.6} \]

\[ = \frac{84,700,000 \text{ lb in}^2}{1.6} \]

Set equal...
\[ 1,822,500 \text{ lb in} = \frac{\pi}{L} 84,700,020 \text{ lb in}^2 \]

\[ L = \pi \frac{84,700,020}{1,822,500} \text{ in} = 146 \text{ in} = 12 \text{ ft} \]

Answer: Max unbraced length is 12 ft...

Discussion: the two FOS values were the same so they canceled out. I put them into the problem to illustrate that we could have different FOS values for different phenomena.