SHOW ALL WORK!!!!
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!
Use the conversion constants and data given on the front page.

(a) Calculate the x-coordinate of the center of mass of the object shown. It is a thin sheet of metal of uniform density in the shape given.

(b) If the density depends on x as \( \rho = \rho_0 x \), now recalculate the x-coordinate of the center of mass.

\[
\begin{align*}
Y_{cm} &= \frac{\int_{x_0}^{x_0} x \, dm}{\int_{x_0}^{x_0} dm} \\
&= \frac{\int_{x_0}^{x_0} x \rho_0 t x^5 \, dx}{\int_{x_0}^{x_0} \rho_0 t x^5 \, dx} \\
&= \frac{\int_{x_0}^{x_0} x^6 \, dx}{\int_{x_0}^{x_0} x^5 \, dx} \\
&= \frac{\frac{1}{7} x^7 \bigg|^0_{x_0}}{\frac{1}{6} x^6 \bigg|^0_{x_0}} = \frac{6 x_0}{7}
\end{align*}
\]

\[
\begin{align*}
Y_{cm} &= \frac{\int_{x_0}^{x_0} x \, dm}{\int_{x_0}^{x_0} dm} \\
&= \frac{\int_{x_0}^{x_0} x \rho_0 t x^6 \, dx}{\int_{x_0}^{x_0} \rho_0 t x^6 \, dx} \\
&= \frac{\frac{1}{8} x^8 \bigg|^0_{x_0}}{\frac{1}{7} x^7 \bigg|^0_{x_0}} = \frac{7}{8} x_0
\end{align*}
\]