Problem 3.1) A 200 pound crate is suspended by two ropes as shown. Determine the tension in each rope.

Given:
Free Body Diagram (FBD)

Find: Tension in ropes AB and AC

Assumptions: 1) Forces in AB, AC, and AD are concurrent at A (meet at one point — A)
2) The mass of the ropes are negligible

Equations:
\[ \sum F_x = 0 \]
\[ T_B \cos(\theta) - T_C = 0 \]
\[ \sum F_y = 0 \]
\[ T_B \sin(\theta) - 200 = 0 \]

Solution:
\[ T_B \cos 30^\circ = T_C \]
\[ (400 \text{ lbs})(\cos 30^\circ) = T_C \]
\[ 346.41 \approx 346 \text{ lbs} = T_C \]
\[ T_B = \frac{200 \text{ lbs}}{\sin 30^\circ} = 400 \text{ lbs} \]

\[ T_C = 346 \text{ lbs} \]
\[ T_B = 400 \text{ lbs} \]