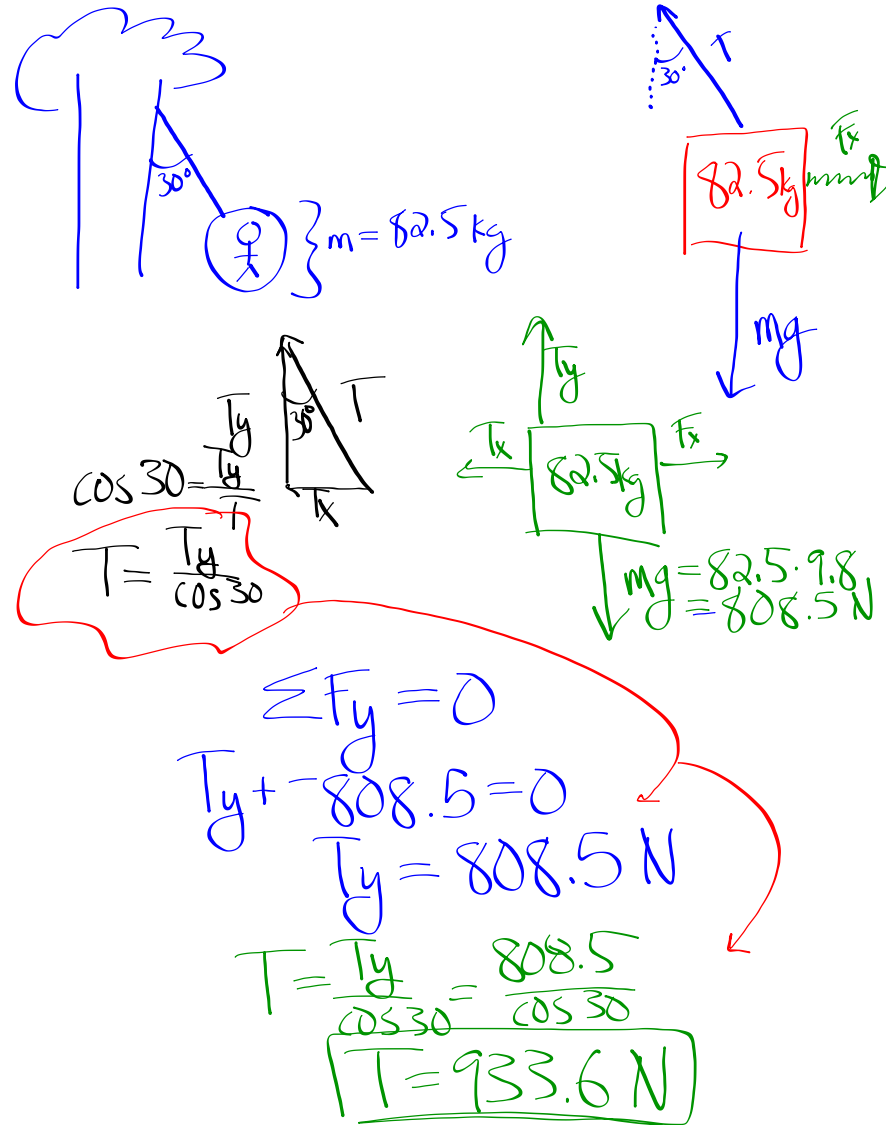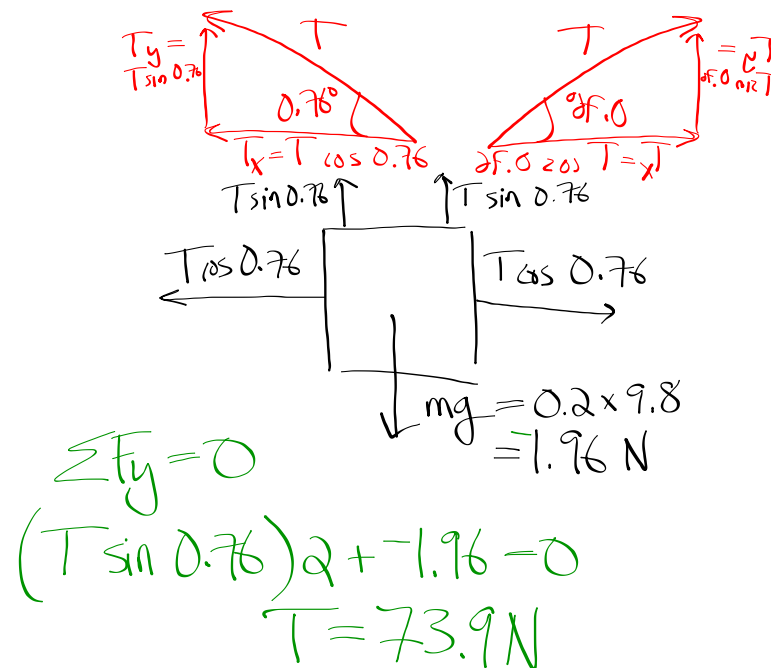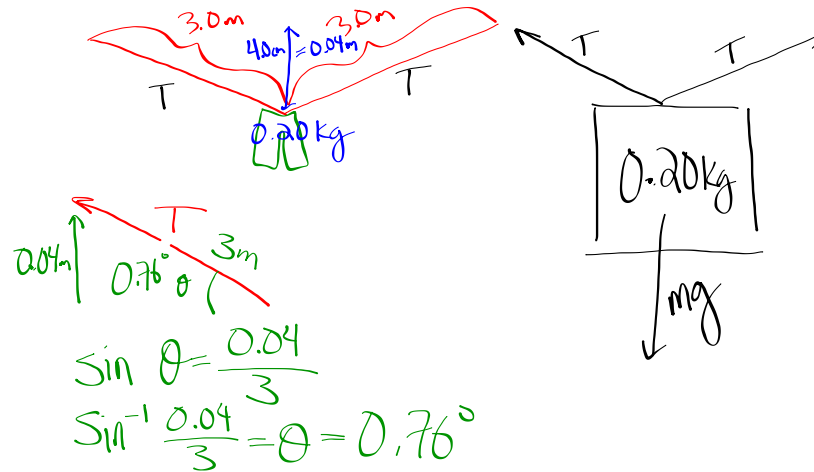A child likes to hang on a tire tied to a tree branch. If the child and tire have a combined mass of 82.5 kg and are pulled back far enough to make an angle of 30.0° with the vertical, what is the tension in the rope supporting her? (Do not worry about the fact that the horizontal forces will not balance. If it makes you feel better, assume someone is holding the child and tire there by applying a horizontal force.) [934 N]

$m = 82.5 \, kg$

$82.5 \, kg$  Fx

mg

$\cos 30 = \dfrac{T_y}{T}$

$T = \dfrac{T_y}{\cos 30}$

$T_y$

$T_x$   $82.5 \, kg$   Fx

$mg = 82.5 \cdot 9.8$
$\quad = 808.5 \, N$

$\Sigma F_y = 0$

$T_y + {}^-808.5 = 0$

$T_y = 808.5 \, N$

$T = \dfrac{T_y}{\cos 30} = \dfrac{808.5}{\cos 30}$

$\boxed{T = 933.6 \, N}$

A 0.20 kg bathing suit is hung by a clothespin in the center of a 6.0 m long clothesline that causes the line to sag 4.0 cm. What is the tension in the clothesline? (Hint: Draw a free body diagram of the point of the clothesline from which the bathing suit is hung from. Also, use the dimensions of the problem to find the angle for the tension forces.) [74 N]



$$\sin \theta = \frac{0.04}{3}$$

$$\sin^{-1} \frac{0.04}{3} = \theta = 0.76°$$

$$mg = 0.2 \times 9.8 = 1.96 \, N$$

$$\Sigma F_y = 0$$

$$(T \sin 0.76) 2 + {}^-1.96 = 0$$

$$T = 73.9 \, N$$

While walking a tightrope, Harry had some good luck and some bad luck. The good luck was that just as the rope broke, he grabbed the broken ends. The bad luck was that the rope only makes an angle of 12.00° with the horizontal. What force must Harry's arm supply to keep his 180.0 pound (what is this in kg?) body from disaster? [1926 N]



$$180 \text{ lb} \cdot \frac{4.45 \text{ N}}{\text{lb}} = 801 \text{ N}$$

$$\Sigma F_y = 0$$

$$-801 + T\sin 12 + T\sin 12 = 0$$

$$T = \frac{801}{2\sin 12} = \boxed{1926 \text{ N}}$$