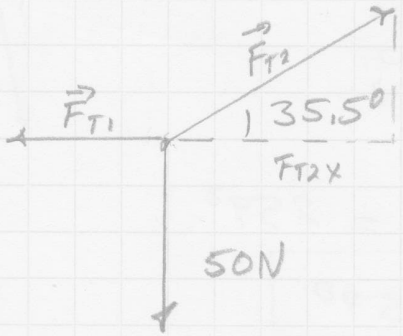
1. a) At the moment he reaches top speed. (As he coasts, friction slows down so, there is a net force on him. Not @ equilibrium).

b) When she reaches constant speed, she is no longer accelerating → The net forces are zero, and she's at equilibrium.

2.



$F_{T1} = 70N$

$F_{T2} = ?$

$\Sigma F_{ix} = F_{T2x} - 70N = 0N$

$F_{T2x} = 70N$

$F_{T2x} = F_{T2} \cos 35.5°$

$F_{T2} = \frac{F_{T2x}}{\cos 35.5°} = 86N$

$\boxed{F_{T2} = 86N}$

OR $\Sigma F_{iy} = F_{T2} \sin 35.5° - 50N = 0$

$F_{T2} \sin 35.5° = 50N$

$F_{T2} = \frac{50N}{\sin 35.5°} = 86N$

3.

$F_{1x} = -7N$	$F_{1y} = 6N$
$F_{2x} = 6N$	$F_{2y} = 8N$
$F_{3x} = 2N$	$F_{3y} = -9N$
$F_x = 1N$	$5N$

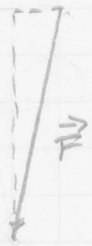
$$\vec{F}_R = (1N, 5N)$$

$$\vec{F}_{eq} = -\vec{F}_R = (-1N, -5N)$$

$$\boxed{\vec{F}_{eq} = (-1N, -5N)}$$

$$F = \sqrt{(-1N)^2 + (-5N)^2} = 5.1N$$

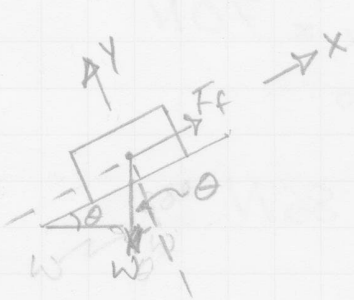
$$\alpha = \tan^{-1}\left(\frac{-5N}{-1N}\right) = 78.7°$$

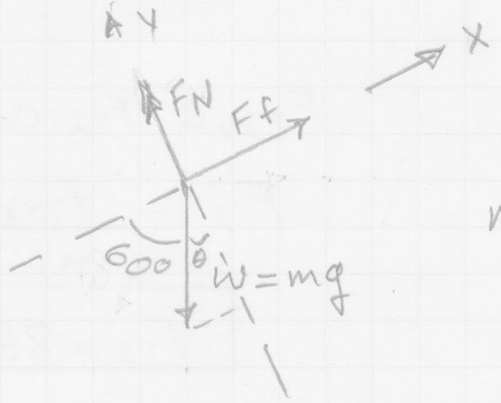


$$\theta = 180° + 78.7° = 259°$$

$$\boxed{\vec{F} = 5.1N @ 259°}$$

4.





$$\Sigma F_x = F_f - W\cos 60°$$

$$F_f = W\cos 60° = (25kg)(9.8m/s^2)\cos 60°$$

$$\boxed{F_f = 122.5N}$$