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Score: 18/20

Physics Midterm 2

1.

a) thrust

weight

Air resistance

b. $a = \frac{F_t - F_a - mg}{m} = \frac{1.230 \cdot 10^7 N - 4.50 \cdot 10^6 N - (5 \cdot 10^5 kg) \cdot 9.8}{5 \cdot 10^5 kg}$

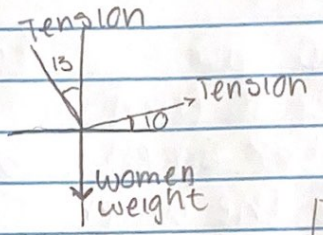
$= 6.2 \, m/s$

2. The force has to be equal of that exerted by the first player so it would be eqaual to -700.

3. The object also requires Friction to decelerate.

(-1) Numerical result for that friction?

4.



$\cos\theta = \frac{a}{n}$

$\cos 75 = \frac{-T_{1x}}{T_1}$

$T_{1x} = -T_1 \cos 75$

$F_{net_x} = ma_x = 0$

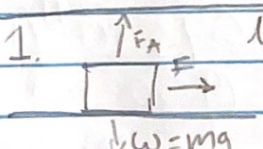
$F_{net_y} = ma_y = 0$

$T_2 = 194 N$

$T_1 = 738 N$

Well done!

1.



$\mu_s = 0.3$

$w = 120(9.80)$

$w = 1180 N$

$\Sigma F_y = ma_y$

$\Sigma F_y = 0$

$F_a + w = 0$

$F_a - 1.180 = 0$

$F_a = 1.180$

$f_s \leq 590 N$

b) $f_k = \mu_k F_a$

$= 0.3(1.180)$

$= 354 N$

$\frac{590 - 354}{120} = 1.97 \, m/s$

2. $g[\sin 25 - \cos 25] = a$

$9.80[\sin 25 - .1 \sin 75]$

$= 3.25$

3. $F_D = \frac{1}{2} C_p A v^2$

$F_D = \frac{1}{2}(.75)(40)^2(.75)(1.225)$

$= 551.3 N$

4. $A = 2\pi rh + 2\pi r^2$
$= 2.52\ m^2$
initial

$E = \frac{\sigma}{\epsilon}$

$\sigma = \frac{F}{A}$

$F = ma$
$F = 2300 \cdot 9.81$
$A = 2.52\ m^2$

$\frac{2.52\ m^2}{-0.0003} = \boxed{8400\ kg/m^2}$

$\epsilon = \frac{L - L_0}{L_0}$
$= -0.0003$

(-1)

$I\omega = r \cdot v / (r)^2$
$= \frac{.5 \cdot 144}{1.5^2}$
$= \boxed{80\ \frac{rads}{s}}$

2. $\tan\theta_s = \frac{v^2}{rg}$

$120\ km/h = v$
$r = .9$
$\tan\theta = \frac{120^2}{.9(9.81)}$
$\theta = \tan^{-1}(1630)$
$= \boxed{89.96^\circ}$

(-1) The driver would be sideways at this angle ...

3. Path two gives the ability to turn at a faster speed because of the wider angle. This way they have a maximum static friction.

(-1) part b?

4. $a_c = \frac{Gm}{r^2}$

$a_c = \frac{6.673 \cdot 10^{-11}(1.4 \cdot 10^{22})}{(4.50 \cdot 10^{12})^2}$

$\boxed{a_c = 4.6 \cdot 10^{-14}\ m/s^2}$

b). $a_c = \frac{Gm}{r^2}$

$a_c = \frac{6.673 \cdot 10^{-11}(8.62 \cdot 10^{5})}{(2.50 \cdot 10^{n})^2}$

$\boxed{a_c = 9.2 \cdot 10^{-10}\ m/s^2}$

(+2) Bonus