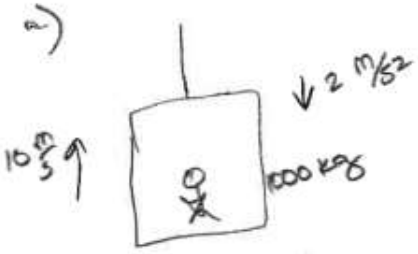
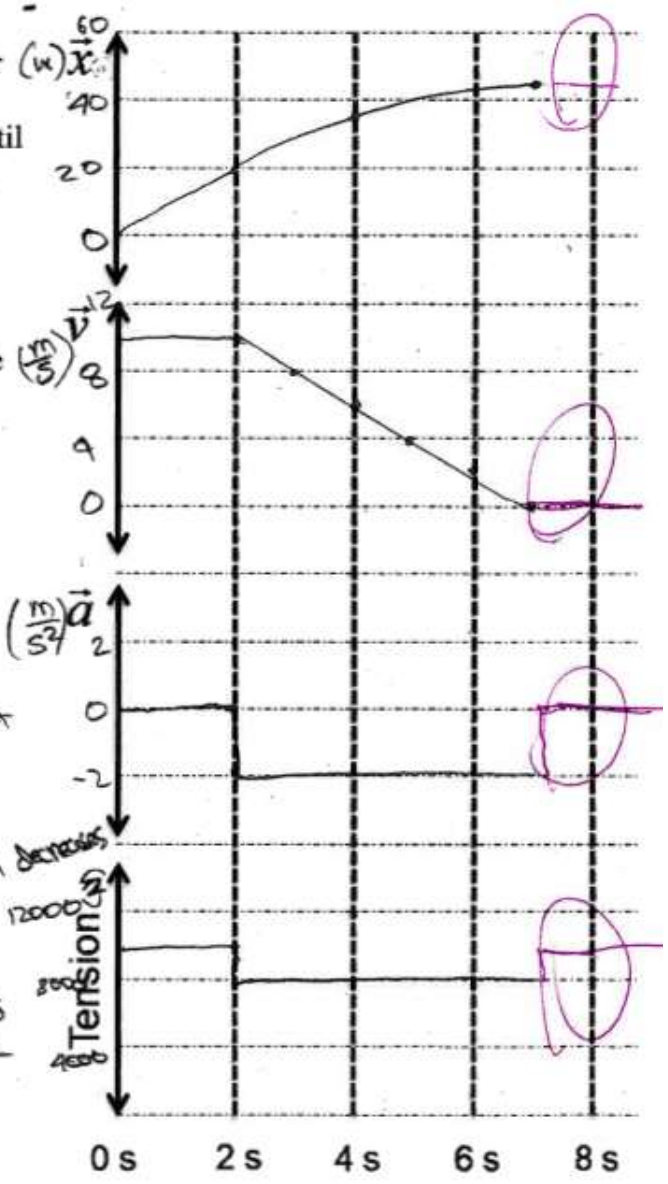
Assessment #3

A- (A)

Imagine that you are traveling upward in an elevator at a constant rate of 10 m/s. after two seconds, you are slowing down at a rate of 2 m/s every second until you stop. The mass of the elevator is 1000 kg (with you in it).

a) Please graph the motion at right. Show work below
b) Please graph the tension on the cable over time. Please use the other side of this page to elaborate the beautiful work behind your answer.





I will use a kinematics lens as it involves expressing motion as an explicit function of time.

$v = 10\ \frac{m}{s}$, constant for first 2 secs, then decreases,

$a = -2\ \frac{m}{s^2}$, 0 for first 2 secs due to constant velocity

$\vec{x}$ = area under velocity curve

From 0–2s: $v_{avg} = \frac{\Delta x}{\Delta t}$

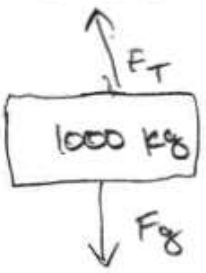
$\Delta x = v\Delta t = 10\frac{m}{s} \times 2s = 20m$

From 2–7s: $v_{avg} = \frac{\Delta x}{\Delta t}$

$\Delta x = v\Delta t = 5\ \frac{m}{s} \times 5s = 25m$

* assuming starting position is ground (0 m)

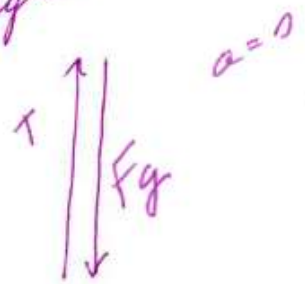
b) from 0-2 s:



$a = 0 \frac{m}{s^2}$

I will be using a dynamics lens as I am looking at how the sum of forces cause acceleration.

ΣF diagram:



$a = 0 \frac{m}{s^2}$

$\Sigma F = ma$

$\Sigma F = m \times 0 \frac{m}{s^2} = 0 N$

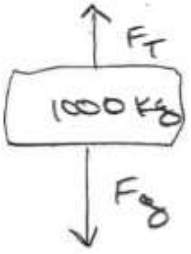
$\Sigma F = F_T + F_g$

$F_g = mg = 1000 kg \times 10 \frac{m}{s^2} = -10000 N$

$0 = F_T - 10000 N$

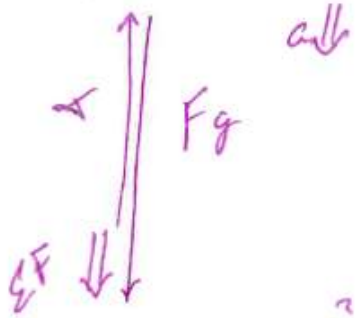
$F_T = 10000 N$

from 2 seconds – 7 seconds (rest):



$\downarrow a = -2 \frac{m}{s^2}$

$\Sigma F = -2000 N$



I will use a dynamics lens as it involves how sum of which forces cause acceleration.

$\Sigma F = ma$

$\Sigma F = 1000 kg \times -2 \frac{m}{s^2} = -2000 N$

$\Sigma F = F_T + F_g \Rightarrow F_g = mg = 1000 kg \times -10 \frac{m}{s^2} = -10000 N$

$-2000 N = F_T - 10000 N$

$F_T = 8000 N$