ACADEMIC DISHONESTY POLICY

Academic honesty is one of the foundations of the educational mission and Catholic commitment of this University. Academic dishonesty, including such practices as cheating, plagiarism and fabrication, undermines the learning experience, and, as it involves fraud and deceit, is corrosive of the intellectual principles and is inconsistent with the ethical standards of this University. Academic dishonesty damages the sense of trust and community among students, faculty and administrators.

Types of Academic Dishonesty

Plagiarism is the act of presenting the work or methodology of another as if it were one's own. It includes quoting, paraphrasing, summarizing or utilizing the published work of others without proper acknowledgment, and, where appropriate, quotation marks. Improper use of one's own work is the unauthorized act of submitting work for a course that includes work done for previous courses and/or projects as though the work in question were newly done for the present course/project. Fabrication is the act of artificially contriving or making up material, data or other information and submitting this as fact. Cheating is the act of deceiving, which includes such acts as receiving or communicating or receiving information from another during an examination, looking at another's examination (during the exam), using notes when prohibited during examinations, using electronic equipment to receive or communicate information during examinations, using any unauthorized electronic equipment during examinations, obtaining information about the questions or answers for an examination prior to the administering of the examination or whatever else is deemed contrary to the rules of fairness, including special rules designated by the professor in the course.

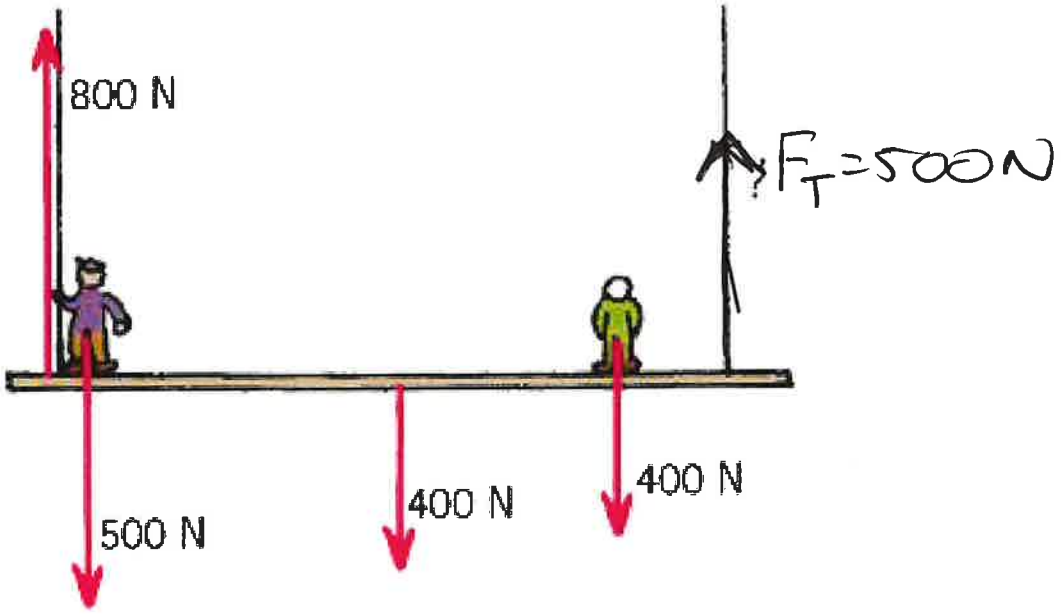
By Signing below, I verify that I have taken this test honestly and have neither cheated nor helped anyone else cheat; this is a mark of academic integrity.

Student Name (Please Print): CARLOS VERO (SOLUTIONS)

Student Signature: _____ Date: Feb 13, 2025

Student ID #: _____ Course Title/Number: PHYS 101

1) **(5 pts)** A staging that weighs 400 N supports two painters, one 500 N and the other 400 N. The tension in the left rope is 800 N. What is the reading in the tension in right rope required to maintain *equilibrium*? (Draw magnitude+direction)

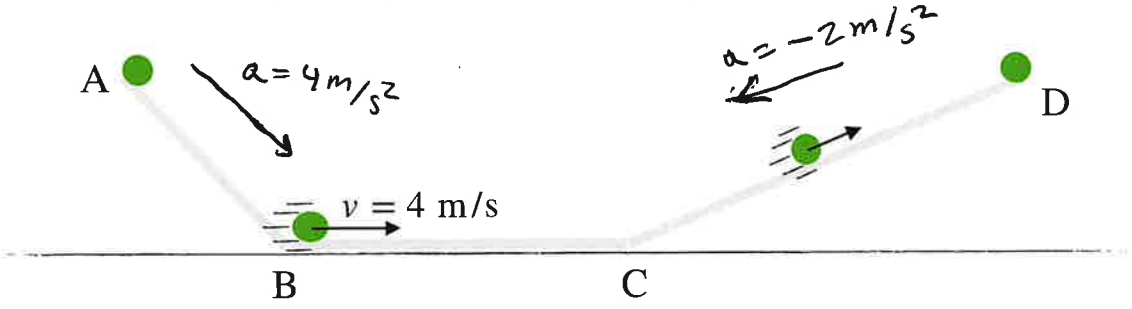


$F_{net} = 0 \Rightarrow 800N + F_T = 500 + 400 + 400\ N$

$\Rightarrow F_T = -800N + 1300N$

$\boxed{F_T = 500\ N}$

2) **(25 pts)** A ball released from *rest* rolls down a frictionless incline plane and comest to *rest* again at point D (take the right direction as "+" positive)



a) **(5 pts)** If the ball takes 1 second to roll from A to B and reaches a speed of $v = 4$ m/s at point B, what is the *acceleration* as it rolls down the incline ?

$$a_{A\to B} = \frac{v - v_0}{t} = \frac{4\ m/s - 0\ m/s}{1\ s}$$

$$\boxed{a_{A\to B} = 4\ m/s^2}$$

b) **(5 pts)** What *distance* does the ball travel from A to B ?

$$d_{A\to B} = v_0 t + \frac{1}{2} a t^2 = \frac{1}{2}(4\ m/s^2)(1\ s)^2$$

$$\boxed{d_{A\to B} = 2\ m}$$

c) **(5 pts)** If the ball travels a distance of 8 meters from B to C, *how long* (time) does it take to roll from B to C ?

$a = 0\ m/s^2$

$$d_{B\to C} = v t$$

$$t = \frac{d_{B\to C}}{v} = \frac{8\ m}{4\ m/s} \Rightarrow \boxed{t = 2\ s}$$

d) **(5 pts)** If the ball takes 2 seconds to travel from C to D and comes to rest at point D, what is the *acceleration* of the ball as it rolls uphill ? (specify magnitude and acceleration)

$$a_{C\to D} = \frac{v - v_0}{t} = \frac{0 - 4\ m/s}{2\ s} \Rightarrow \boxed{a_{C\to D} = -2\ m/s^2}$$

e) **(5 pts)** What distance does the ball travel as it rolls uphill from C to D?

$$d_{C\to D} = v_0 t + \frac{1}{2} a t^2, \quad t_{C\to D} = 2\ s, \quad a = -2\ m/s^2, \quad v_0 = 4\ m/s$$

$$= (4)(2) + \frac{1}{2}(-2)(2)^2 = 8 - 4 = 4\ m$$

$$\boxed{d_{C\to D} = 4\ m}$$

3) **(20 pts)** A parachutist of mass m = 60 kg deploys his parachute:
(take the downward direction as "+" positive)

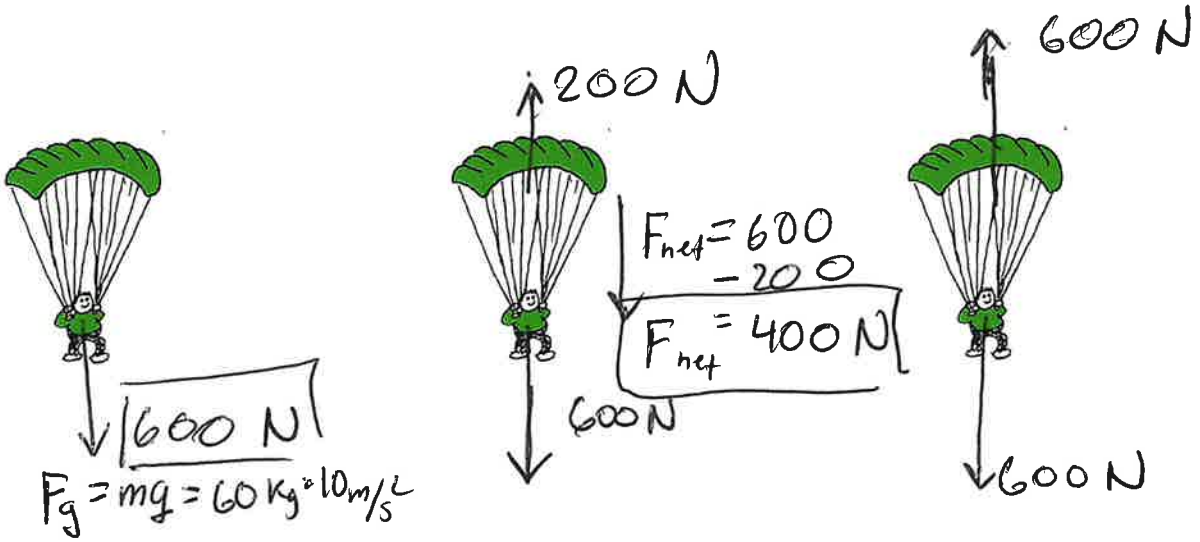


figure (a) figure (b) figure (c)

a) **(5 pts)** Draw all forces (magnitude+direction) acting on the parachutist assuming no air resistance (e.g., *free-fall*) in **figure (a)**

only force due to gravity

b) **(5 pts)** After the parachutist has gained enough speed, the air resistance now becomes 200 N. Draw all forces (magnitude+direction) acting on the parachutist and calculate net force, $\mathbf{F}_{net}$, in **figure (b)**

$$F_{net} = 600N - 200N = \boxed{400N}$$

c) **(5 pts)** Calculate the acceleration of the parachutist in **figure (b)**

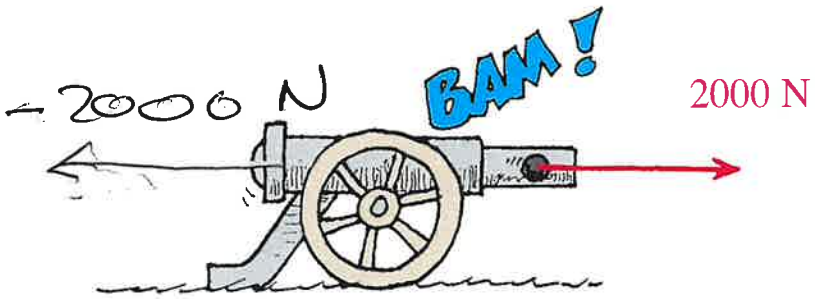
$$a = \frac{F_{net}}{m} = \frac{400N}{60kg} \Rightarrow \boxed{a = 6.67\ m/s^2}$$

d) **(5 pts)** The parachutist air resistance has now increased to 600 N in **figure (c)** Draw all forces (magnitude+direction) acting on the parachutist and calculate the net force $\mathbf{F}_{net}$, and acceleration.

$$F_{net} = 600 - 600 = \boxed{0\ N}$$

$$a = \frac{F_{net}}{m} = \boxed{0\ m/s^2}$$

4) **(15 pts)** A cannonball is fired from a canon with a force of 2000 N



a) **(5 pts)** If the *cannonball* has a mass of $m = 200$ kg, calculate its acceleration

$$F_{net} = ma \rightarrow a = \frac{F_{net}}{m} = \frac{2000\,N}{200\,kg}$$

$$\boxed{a = 10\ m/s^2}$$

b) **(5 pts)** Draw the recoil force (magnitude and direction) on the canon in the figure

Use Newton's 3rd LAW $F_{12} = -F_{21}$

c) **(5 pts)** If the canon has a mass of $M = 4{,}000$ kg calculate the acceleration of its recoil

$$a = \frac{F_{net}}{m} \Rightarrow a = \frac{-2000\ N}{4000\ kg}$$

$$\boxed{a = -0.5\ m/s^2}$$