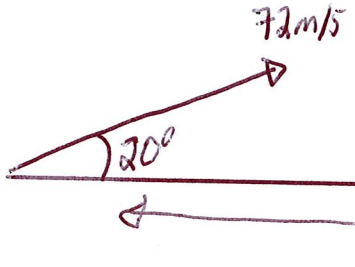
Physics 12 Exam Review Jan 2017 Name: _____

Unit 1 Kinematics

1. Find the hang time and range for the arrow fired at a 20 degree angle above the horizontal with a velocity of 72 m/s.



① $V_y = 24.625$

$V_x = 67.657$

② $t = \frac{2V_y}{a} = 5.0256 \text{ sec.}$ (Hang time)

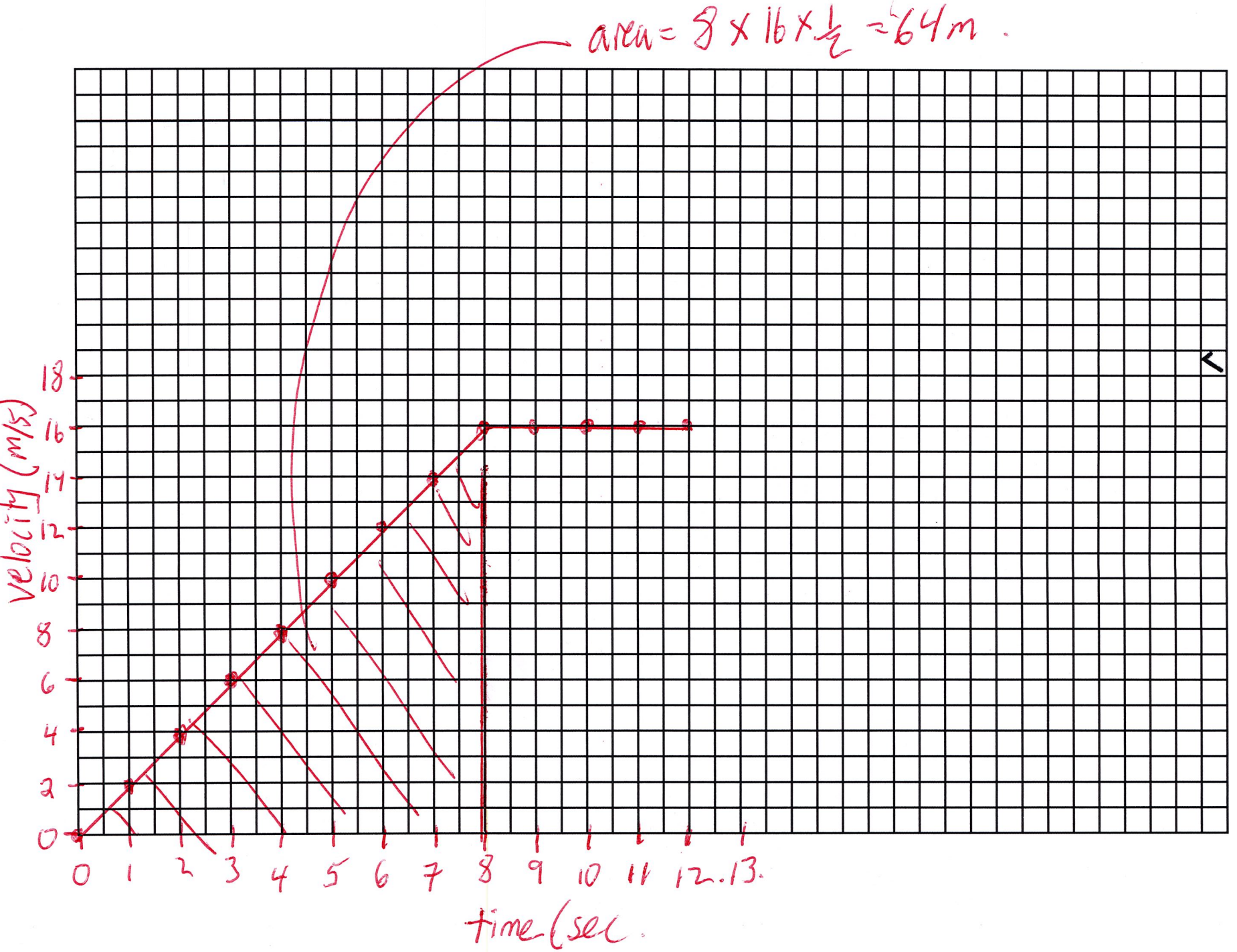
Range = ?

③ $d = V_x \cdot t = (67.657)(5.0256) = 340 \text{ m.}$

2. Construct a velocity vs time graph that represents a car accelerating at 2 m/s2 starting from rest for 8 seconds and then continuing with a constant velocity for another 4 seconds.

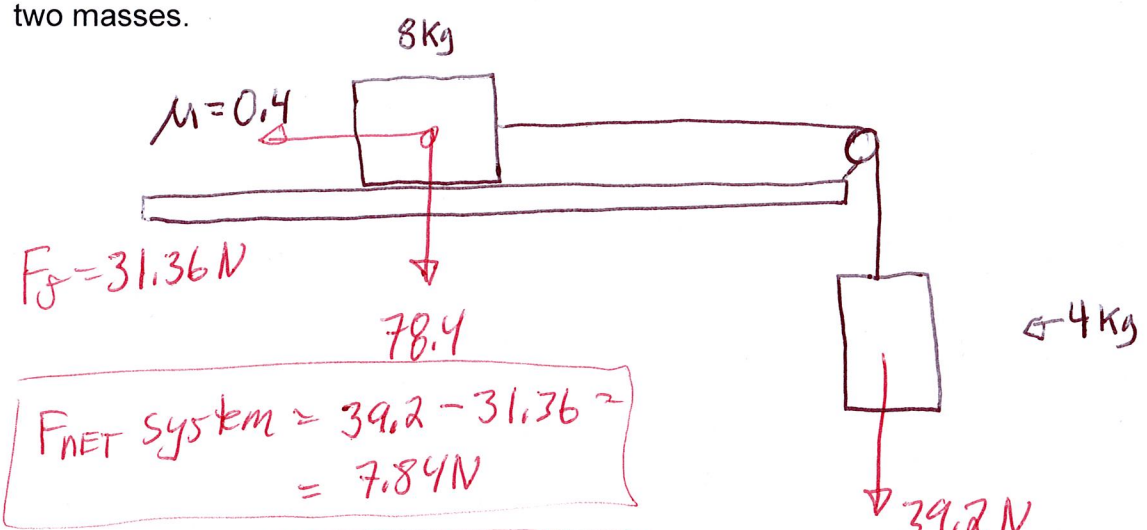
Show how far the car travels from 0 to 8 seconds.

Show your working on the graph.


area = 8 × 16 × 1/2 = 64 m.
velocity (m/s)
0
2
4
6
8
10
12
14
16
18
0 1 2 3 4 5 6 7 8 9 10 11 12. 13.
time (sec.

Unit 2 Forces

Find the find the acceleration of the system and the tension in the cord joining the two masses.



$F_{NET\ system} = 39.2 - 31.36$

$= 7.84N$

$a = \frac{F_N}{m} = \frac{7.84}{12} = 0.653 m/s^2$

(any one mass)

T → look @ hang mass

T = ?

39.2

$F_N = 39.2 - T$, $T = 39.2 - 2.613$

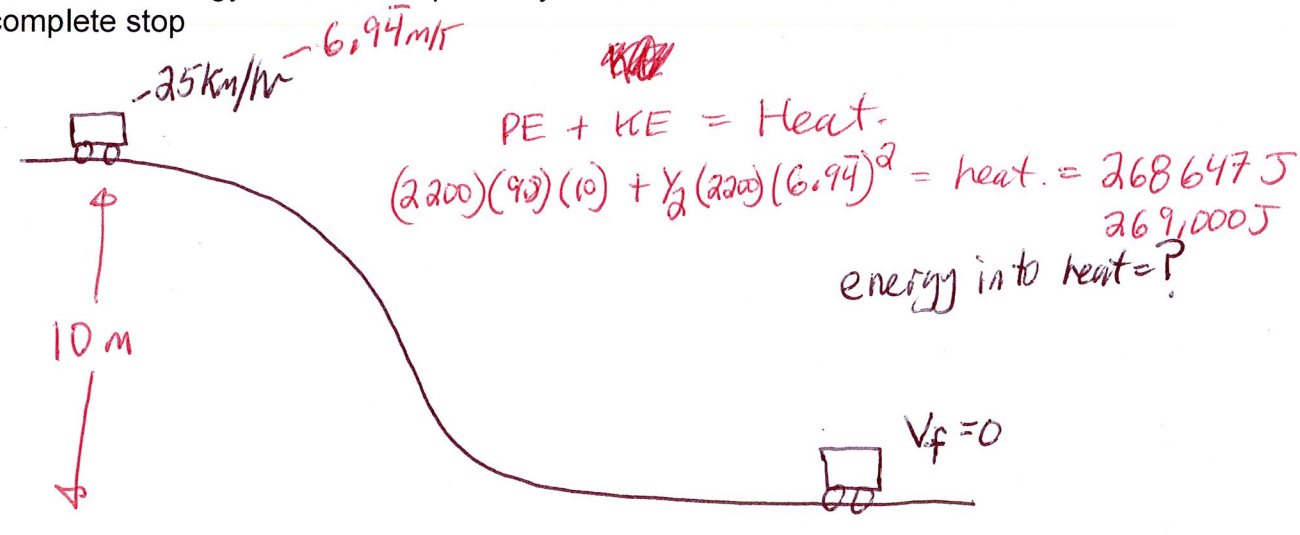
$2.613 = 39.2 - T$, $T = 36.6N$

$F_N = ma = (4)(0.653) = 2.613N$

Unit 3 Energy

A 2200 kg car has a velocity of 25 km/hr at the top of the hill. (10m)

How much energy must be disapated by the breaks for the car to come to a complete stop



PE + KE = Heat.

$(2200)(9.8)(10) + \frac{1}{2}(2200)(6.94)^2 = heat. = 268647 J$

269,000J

energy in to heat = ?

Unit 4 Momentum

A 1900 kg car travelling west at 100 km/hr crashes head on into a 16,000kg semi going east at 60km/hr. What is the velocity of the wreck?

+ 27.7 m/s

16.6

$mv + mv = mv$

$(1900)(27.7) + (16000)(-16.6) = 17,900(v)$

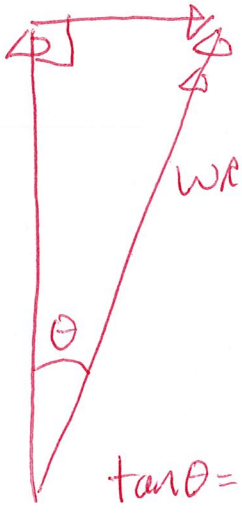
$-213,783 = 17,900v$

$v = -11.9 m/s$

A 2600 kg truck travelling north at 90 km/hr collides with a 1800 kg car travelling east at 30 km/hr. Find the velocity (direction and speed) of the wreck.

8.33 m/s truck $p = mv = (2600)(25) = 65,000$ N·s

car $p = mv = (1800)(8.33) = 15,000$ N·s



$15,000^2 + 65,000^2 = p^2_{WRECK}$

WRECK $p = 66,708$ N·s

$v = p/m = \frac{}{4400 kg} = 15.2 m/s$

$\tan\theta = \frac{15,000}{65,000} = 0.2307$

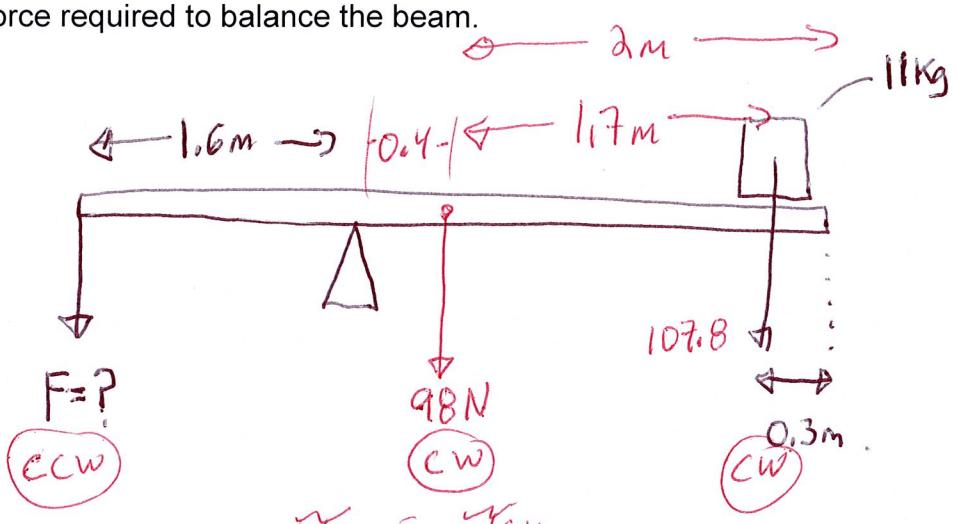
$\tan^{-1}$

$\theta = 12.99 = 13^\circ$ E of N

uniform 4m beam, 10kg

Unit 5 Static Equilibrium

Find the force required to balance the beam.

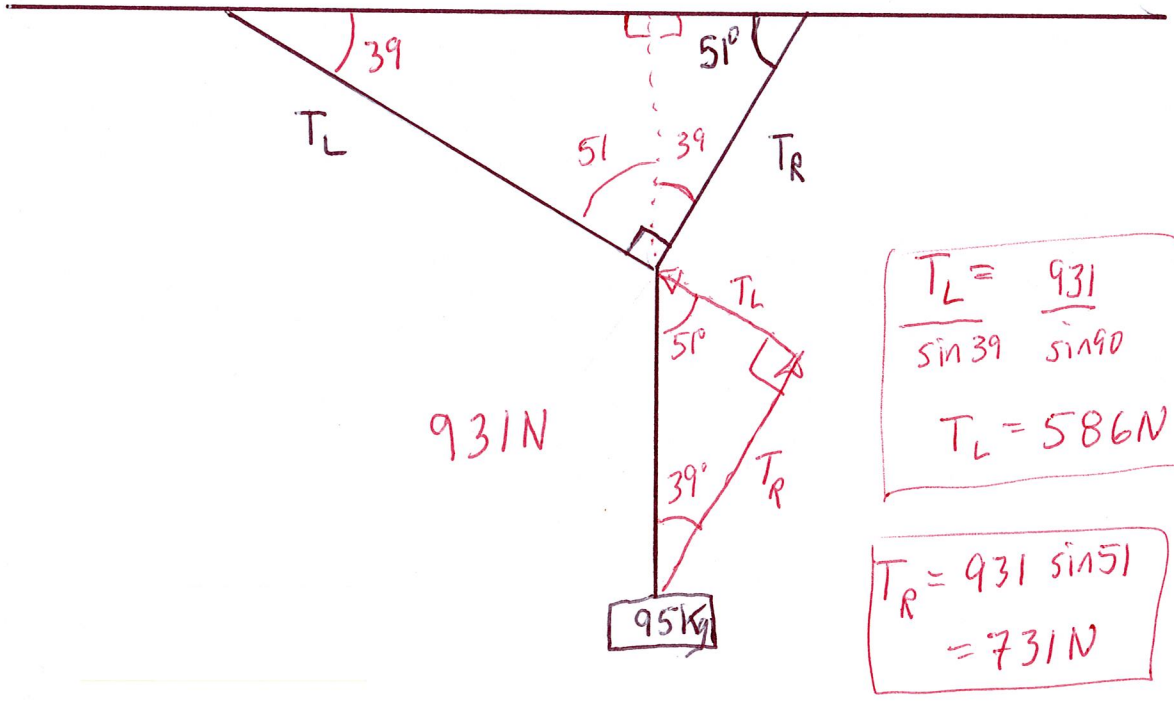


$\tau_{ccw} = \tau_{cw}$

$F(1.6) = (98)(0.4) + (107.8)(2.1) = 265.58$

$F = 424.9 = 425N$

Find the tension in the cables supporting the hanging mass



$\frac{T_L}{\sin 39} = \frac{931}{\sin 90}$

$T_L = 586N$

$T_R = 931 \sin 51$

$= 731N$

Unit 6

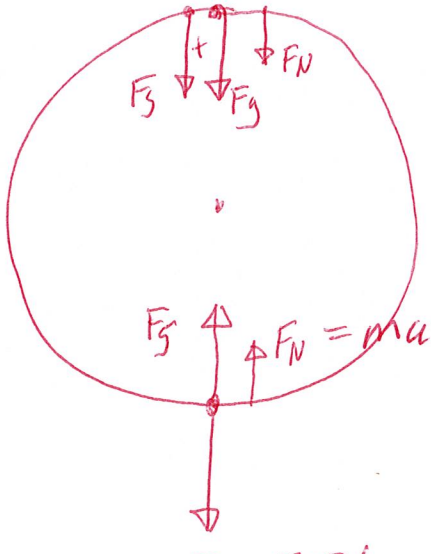
$93.\overline{3}\ m/s^2$.

A jet plane is travelling at 280 km/hr and while in combat pulls a loop with a radius of 74 m. The pilot has a mass of 72 kg.

Find the force on the pilot from the seat at the top and bottom and top of a loop.

$$a_c = \frac{v^2}{R} = \frac{(93.\overline{3})^2}{74}$$

$$= 117.7\ m/s^2.$$



@ top $F_N = F_S + F_g$

$F_N - F_g = F_S$

$8475 - 705.6 = F_S$

$F_S = 7769N$

@ Bottom $F_N = F_S - F_g$

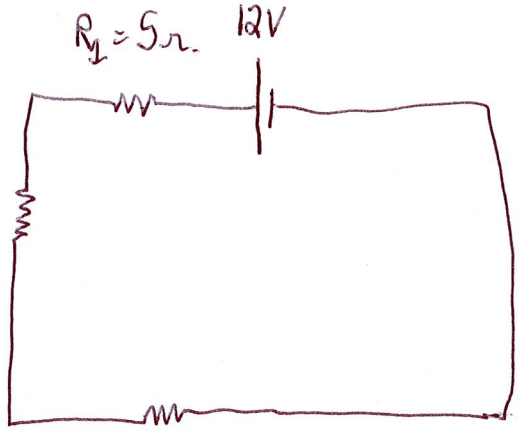
$F_S = F_N + F_g$

$= 8475 + 705.6$

$= 9181N$

Unit 8/Electricity

Find the missing values in the circuits below.



$I_1 = .6$ $V_1 = 3$

$I_2 = .6$ $V_2 = 3.6$

$I_3 = .6$ $V_3 = 5.4$

(1) $R_T = 5 + 6 + 9 = 20\Omega$

(2) $I = \frac{V}{R} = \frac{12}{20} = 0.6A$ → same everywhere, series.

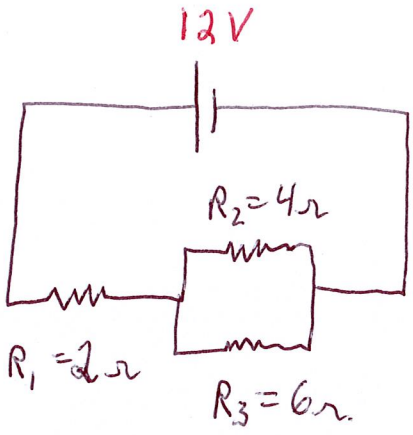
(3) $V_1 = IR_1 = (.6)(5) = 3V$

(4) $V_2 = IR_2 = 3.6V$

(5) either $V_3 = IR_3 = 5.4V$ (OR) $12 = 3 + 3.6 + V_3$

$V_3 = 5.4$

Find the missing values in the circuits below.



$I_1 = 2.727A$ $V_1 = 5.454V$

$I_2 =$ ___ $V_2 = 6.54V$

$I_3 =$ ___ $V_3 = 6.54V$

(1) $R_T = 2.4\Omega + 2 = 4.4\Omega$.

(2) $I = \frac{V}{R} = \frac{12V}{4.4\Omega} = 2.727\,A$.

(3) $V_1 = I_1 R_1 = (2.727)(2) = 5.454\,V$

(4) $12 = 5.454 + V_2$ $V_2 = 6.54\,V$

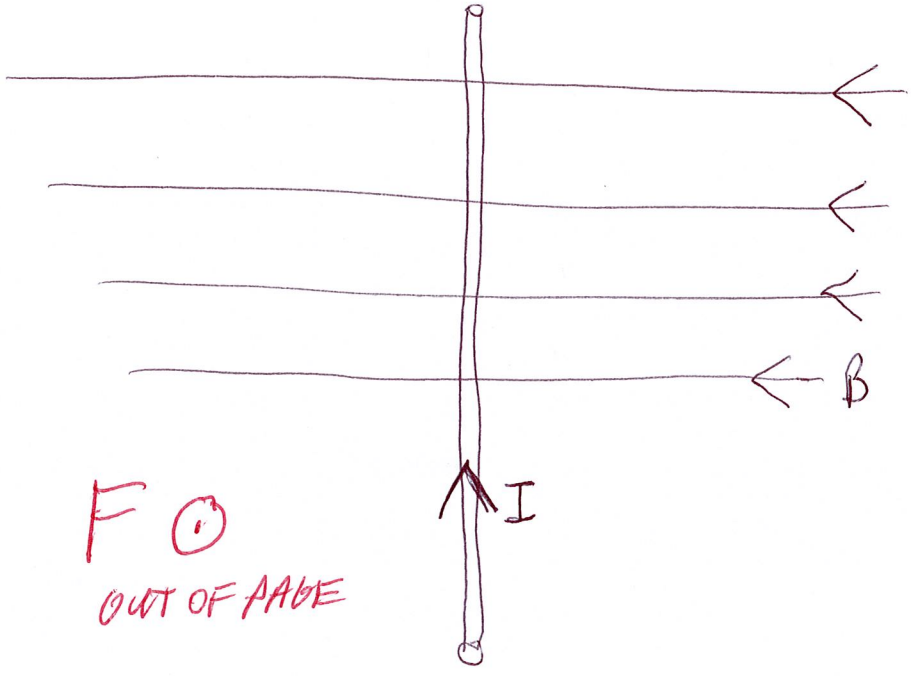
same for V_3, bottom loop

(5) $I_2 = \frac{V_2}{R_2} = \frac{6.54V}{4} = 1.636A$

(6) $I_3 = \frac{V_3}{R_3} = \frac{6.54}{6} = 1.0909A$.

Unit 9 – Electromagnetism

Find the direction of the force in the example below.



Find the direction of the current in the direction below