Midterm

Estimations and unit Analysis

$S = \frac{d}{t}$ $\quad S = \frac{.25 \times 2}{1.5} = \frac{.5\,km}{1.5\,s}$

1 $\quad S = .33\ km/s$

$\frac{.33\,km}{s} \times \frac{1000m}{1km} = 330\,m/s$

$\frac{.33\,km}{s} \cdot \frac{3600\,sec}{1hr} = 1188\,km/hr$

C

2 $\quad .25m^3 = 250{,}000\,cm^3$

B

① ② ③

3. $\frac{100\ km}{hour} \cdot \frac{1000m}{1km} \times \frac{1\ hour}{3,600sec} = 27.7 m/s$

(B)

4. $D = \frac{m}{V}$

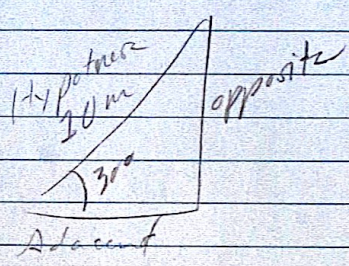
$9\ kg \times \frac{1000g}{1kg} = 9000g$

$D = \frac{9000\ g}{1000\ Cm^3}$

$0.001 m^3 = 1000\ Cm^3$

$B = 9.0\ g\ Cm^{-3}$, Copper

3. Vectors



1. $Cos = \frac{Adjacent}{Hyp}$

$Cos\ 30 = \frac{x}{10m}$

$.86 = 10m$

$x = 8.6$

$Sin\ 30° = \frac{Y}{10m}$

$0.5 = 10m$

$5j$

$\vec{X}_1 = 5\sqrt{3}i + 5j$

A

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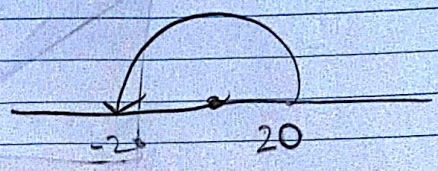
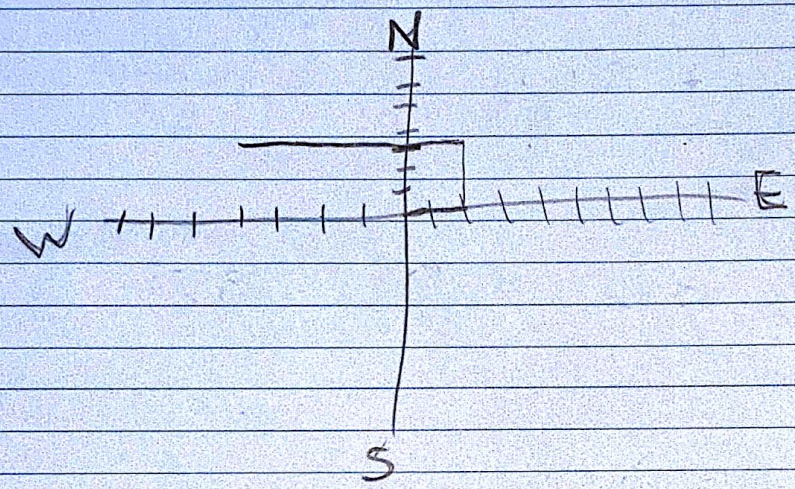
2. 20 180°

$D = -20$



3.



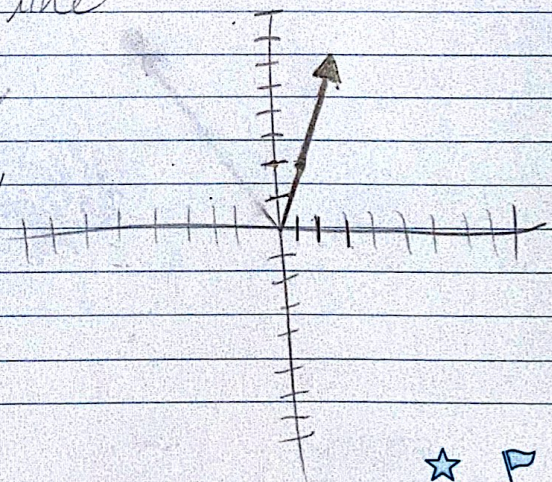
$500m \times \frac{1km}{1000m} = 0.5$

A) $x = -4\hat{i} + 3\hat{j}\ (km)$

4) Motion Along a Straight line

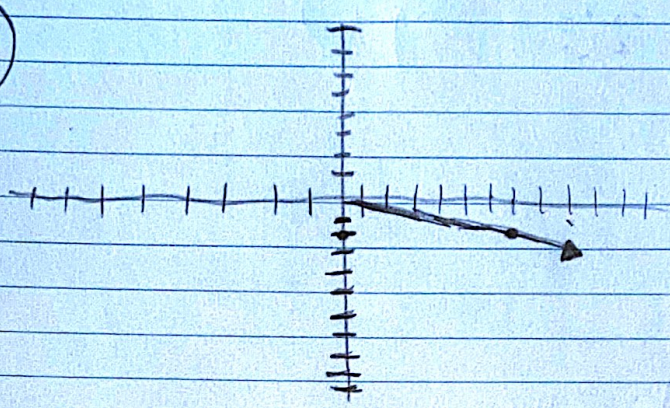
1)

D) positive Constant velocity



2) A) 2 m/s $2/1 = 2$

3)



$x = 0$ $t = 2$ $-2 \cdot 2 + 7 * 2^2$

$x = 24$

$\frac{0+24}{2} = 12 m/s^2$ C

4) $t = 0 - 2 = 2$

$\frac{v_f - v_i}{t_f - t_i}$ $\frac{24 - 0}{2 - 0} = 12 m/s^2$ C

5) $\frac{v_f - v_i}{t_f - t_i} = \frac{10.0 m/s - 0}{t - 0} = \frac{5.0 m/s^2}{1}$

A) $\frac{5.0 m/s^2 (t) = 10.0 m/s}{5.0 m/s \quad 5.0 m/s^2} =$ B 2 Sec

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B) $v^2 = v_i^2 + 2a\Delta x$

$100 = 0 + 2(5.0 m/s^2) D$

$\frac{100}{10} = \frac{10 D}{10}$

$D = 10$

B = 10 meters

C) 2 sec = 10 meters

$v = \frac{\Delta x}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$ $\quad 10.0 m/s = \frac{90 m}{t}$

$10.0 m/s\,(t) = 90 m$

$t = 9$ sec + 2 sec = 11 sec

C 11 sec

5. Motion in two and 3 Dimensions

1. $\vec{y}(t) = (-\frac{1}{2} g t^2 + v_i y t + y_i)\hat{j}$

$0 = (-\frac{1}{2} 9.80 m/s^2 t^2 + 0 + 162.5)$

$0 = \frac{9.8}{2}$

$0 = (4.9 m/s\, t^2 + 162.5)$

$4.9 t^2 = -4.9 t^2$

$\frac{4.9 t^2}{4.9} = \frac{162.5}{4.9}$

$\sqrt{t^2} = \sqrt{33.1}$

$t = 5.75$

record pause stop

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Bonus: ICe

I. Continued

$$V = \frac{\Delta y}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

$$V = \frac{75 - 0}{5.75}$$

$$V = 13.0 \text{ m/s}$$

B = 13 m/s

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record pause stop

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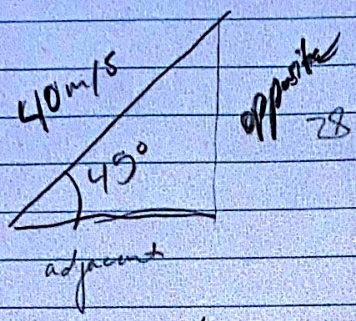
2)



$\sin 45 = \frac{Y}{40\,m/s}$ $\quad \cos 45 = \frac{X}{40\,m/s}$

$.70 = \frac{40\,m/s}{Y}$ $\quad .70 = \frac{40\,m/s}{X}$

$Y = 28\,m/s$ $\quad X = 28\,m/s$

$\vec{V}_y = (v_{i,y} - gt)\hat{j}$

$0 = (28\,m/s - 9.80\,m/s\,t)\hat{j}$

$+9.80\,m/s$

$\frac{9.80\,m/s\,t}{9.80} = \frac{28\,m/s}{9.80}$ $\quad t = 2.85 \cdot 2 = 5.7\,sec$

$28 = \frac{d}{5.7\,sec}$

$d = 160\,m$ C

3) B 5.5sec

6. Forces

47cm 68cm 68cm − 47cm = 21cm

$21\text{cm} \times \frac{1\text{m}}{100\text{cm}} = .21\text{m}$

$\vec{F} = -k\Delta\vec{x}$

$250\text{g} \times \frac{1\text{kg}}{1000\text{g}} = .25\text{kg}$

$.25\text{kg} = -k \cdot .21\text{m}$

$D = 12\text{N/m}$

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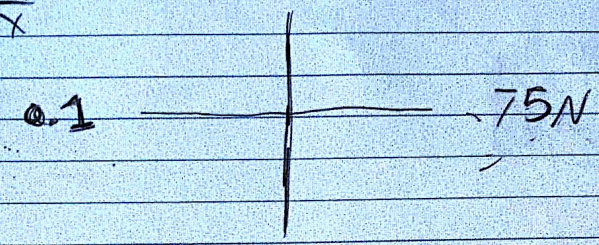
$\vec{S} = -k\Delta\vec{x}$

2)



$f = \mu N_T$

$0.1 = 75g \cdot 9.8 m/s^2$

735.

$0.1 \times 735 = 73.5$

$75 - 73.5 = 1.5N$

$\frac{1.5}{75} = \frac{75kg\ a}{75}$

$.02 = a$

$A = 0 m/s^2$

Bonus: Ice