Midterm #1

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1. $T = 1.5$ $d = 0.5$ $\quad \frac{2d}{t} = \frac{2 \times 0.5}{1.5} = 666.67$ m/s

$0.667 = 0.667 \times 3600 = 2400$ km/hr

2a. $0.25 m^3 \rightarrow cm^3$ $\quad 1m = 100000$ Cm

$0.25 \times 1000000 = 250{,}000 cm^3$

2b. 100 km/hr → m/s

$\frac{100 \text{ km}}{\text{hr}} \times \frac{1000 m}{1 \text{ km}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 s} = 27.7$ m/s

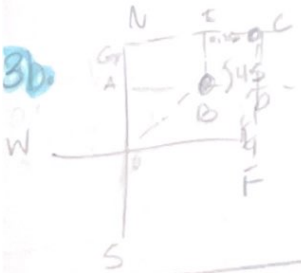
2c. $2 kg\ m\ s^{-2} \rightarrow gm\ cm\ ms^{-2}$

$2 \times 10 = 20$ g/cm ms^2

3a. $\vec{x_1} = 10\cos 15 + 10 \sin 15$ $\quad \vec{x_2} = 20\cos 135\, i + 20 \sin 135\, j$

$\vec{x_1} = 9.66i + 2.588j$ $\quad = -14.142i + 14.142j$

3b.



$BD = BE = \frac{0.25}{\sqrt{2}} = 0.177$

$AB + BD = 0.5 + 0.177 = 0.677$

$OA + AH = 0.92 + 0.177 = 0.677$

$(0.677, 0.677)$

$= OB + BC$

$\sqrt{OA^2 + AB^2} + BC$

$\sqrt{(0.5)^2 + (0.5)^2} + 0.25$

$= 0.957$ km

4a. $x(t) = -1.0 - 4.0t$

$= -1.0 - 4.0(-2.0) = 7$

$= -1.0 - 4.0(2.0) = -9$ $\quad = -2m$

4b. $x(0) = -2(0) + 2(0)^2 = 0$ $\quad \frac{4-0}{2-0} = 2$

$x(2) = -2(2) + 2(2)^2 = 4$

$x(1) = -2(1) + 99 = -47$

4. $9.0 m/s^2$

$\frac{10.0}{5.0} = \boxed{2 m/s^2}$

$S = ut + \frac{1}{2}at^2$

$S = (0 \times 2) + (\frac{1}{2} \times 5 \times 2^2)$

$\boxed{S = 10m}$

$100 - 10 = 90$

$90/10 = 9$

$2 + 9 = \boxed{11 sec}$

5a. $H = 162.5$

$162.5 = 0 + \frac{1}{2} \times g \times t^2$ H

$t^2 = \frac{2 \times 162.5}{9.8} = \frac{325}{9.8} = 33.16$

$= \boxed{5.76 sec}$

$\frac{40}{5.76} = \boxed{6.94 m/s}$

5b. $V = 40$

$\theta = 45$

$x = \frac{v^2 \sin 2 \times 45}{g}$

$x = (40)^2 \sin 90$

$\frac{x = 1000 \times 1}{9.8}$

$\boxed{X = 163.3m}$

$t = \frac{2 v \sin 45^\circ}{g}$

$t = \frac{2 \times 4 \times 0.707}{9.8}$

$\boxed{t = 5.8 sec}$

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6. $F_x = F_1 \cos 45 + F_2 \cos 30$

$F_x = (10N)(\cos 45) + (8N)(\cos 30^\circ)$

$= 14.0N$

$F_y = F_1 \sin 45^\circ - F_2 \sin 30$

$F_y = (10N)(\sin 45^\circ) - (8N)(\sin 30^\circ)$

$= 3.07N$

$F = \sqrt{(14.0)^2 (3.07)^2}$

$= 14.3 N$

$\theta = \tan^{-1} \left(\frac{3.07N}{14.0N}\right)$

$= 12.4^\circ$

$a = \frac{14.3N - 7.5N}{49kg}$

$= 0.14 m/s$