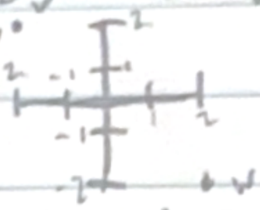
Physics Midterm 1

Unit 0

1. C: 11.05 cm^{-2}
2. C: 10 hours D/t $\frac{600\,km}{60\,km/h} = 10h$
3. D: 90 km
4. C: $\frac{1}{6}$ $km\,hr^{-1}s^{-1}$ $a = \Delta V/\Delta t$ $\frac{10-0}{60} = \frac{10}{60} = \frac{1}{6}$
5. A: 5000 m^2
6. D: 4×10^4
7. D: -7.1 and -7.1 km/hr
8. A: 225°

9. $\vec{v} = -2\hat{i}+2\hat{j}$ $\vec{v} = 2\hat{i}-2\hat{j}$

a)

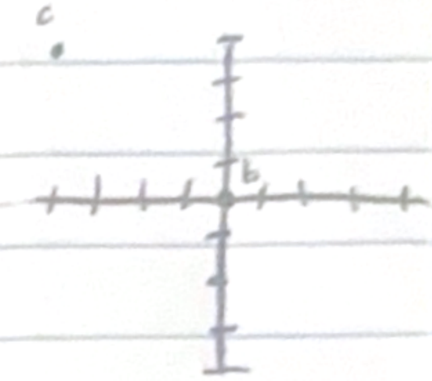


b) $-2\hat{i}+2\hat{j}$

$2\hat{i}-2\hat{j}$

$0\hat{i}+0\hat{j}$

0



c) $-2\hat{i}-2\hat{i}+2\hat{j}+2\hat{j}$

$-4\hat{i}+4\hat{j}$

d) $(-2\hat{i}+2\hat{j})(2\hat{i}-2\hat{j})$

$(-2\hat{i})(2\hat{i})+(-2\hat{j})(2\hat{j})$

$-4-4$

$= -8$

Unit 1

1. $v_0 = 15m/s$, $a = 3m/s^2$, $t = 4s$ $v = v_0 + at$ $v = 15m/s + (3m/s^2)(4s)$

a) 27 m/s $v = 15 + 12$

$v = 27 m/s$

b) 84m $x = v_0 t + \frac{1}{2}at^2$ $= 15(4) + \frac{1}{2}(3)(4)^2$ $60 + \frac{1}{2}(3)(16)$ $60 + 24$ $84m$

c) Average velocities are different $v_{avg} = \frac{84}{4} = 21 m/s$

Instantaneous are the same

2. P: $t = 10s$ Q: $t = 25s$

a) $v_p = \frac{\Delta x_p}{\Delta t_p} = \frac{601-339}{10-5} = \frac{262m}{5s} = 52.4 m/s$

$v_q = \frac{\Delta x_q}{\Delta t_q} = \frac{2139-1500}{25-20} = \frac{639}{5} = 127.6 m/s$

b) $a = \frac{v_q - v_p}{\Delta t} = \frac{127.6-52.4}{25-10} = \frac{75.2}{15} = 5.01 m/s^2$

3. a) 9.75m

a) $\frac{6.0 m/s^{-1}}{.8 m/s^{-2}} = 7.5m$

b) 9.375s

4. $R_{range}: 60m = \frac{v_0^2 \sin(2\theta)}{g} = \frac{(25)^2 \sin(2(55))}{9.81}$

$\downarrow$

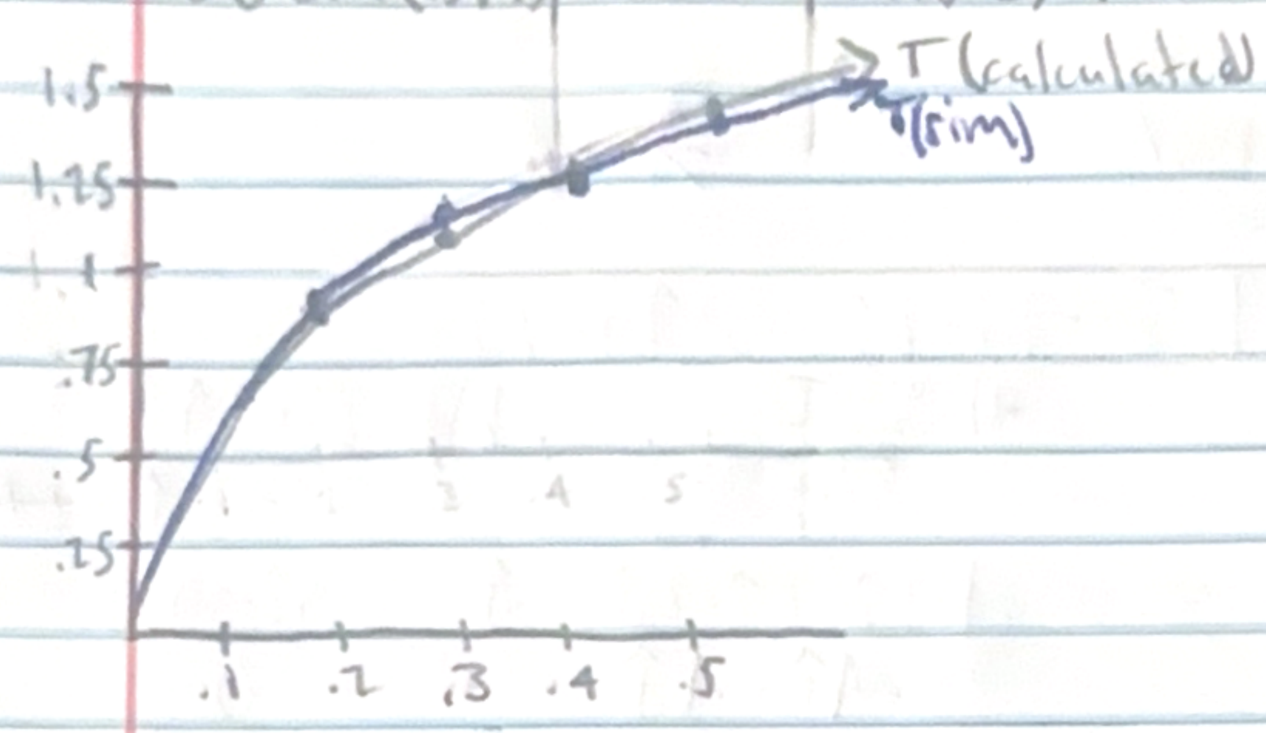
$\frac{625(.9396)}{9.81}$

$\downarrow$

$59.868m$

5.

Length (L)	Time (T)	Time calculated: $T = 2\pi\sqrt{L/g}$
20 cm (.2 m)	.89 s	$2\pi\sqrt{.2/9.81} = .897$ s
30 cm (.3 m)	1.15 s	$2\pi\sqrt{.3/9.81} = 1.09$ s
40 cm (.4 m)	1.22 s	$2\pi\sqrt{.4/9.81} = 1.26$ s
50 cm (.5 m)	1.39 s	$2\pi\sqrt{.5/9.81} = 1.41$ s



Unit 2. 1. a) $F_{horiz} = f \cdot \cos\theta = 1000 \cdot \cos(7) = f_{horiz} = 992.54$N

b) 50613 m/s

$f_{friction} = .05(900)(9.81) = 441.45$N

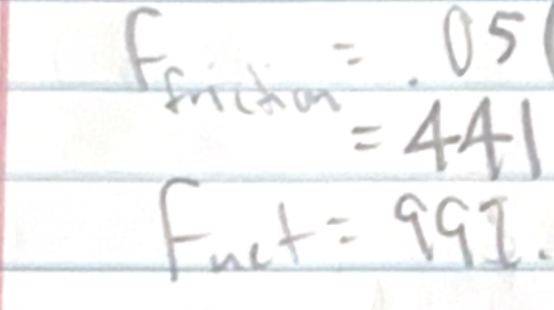
$f_{net} = 992.54 - 441.45 = 551.09$

$a = \frac{f_{net}}{m}$ $\frac{551.09}{900} \approx 0.613$

2. a) -1.2 km/s $\frac{120000 \text{ m/hr}}{100 \text{ m}} = 1200$m

b)

3.



$\sin(45) = \frac{o}{10}$ $\tan 45 = \frac{7.07}{h}$

$10(\sin 45) = 7.07$

$\sin(30) = \frac{o}{8}$ $\tan 30 = \frac{4}{h}$

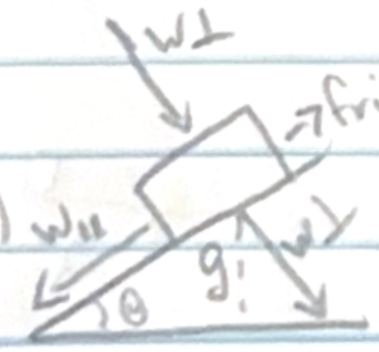
$8(\sin 30) = 4$ 2.309

≈ 1.879N →

$f_{net} = 50kg(1.879)$

$f_{net} = 93.95$ m/s

Unit 3 1. a)



b) $a = g(\sin\theta)$

2. a) $a = 9.81(\sin 10 - .1\cos 10)$

$9.81(.1736 - .0984)$

$a = .7369 \text{ m/s}$

b) $.7369(30) = 22.107 \text{ m}$

4. a)

b) $\Sigma(-k)\Delta\vec{x} = \vec{F}$

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

c) $\Delta\vec{x} = \frac{\vec{F}}{\Sigma(-k)}$

$\frac{\Sigma(-k)\Delta\vec{x}}{\Sigma(-k)} = \frac{\vec{F}}{\Sigma(-k)}$

5. a) 84.58 m/s

$F_D = \frac{1}{2}C_\rho A v_t^2$

$(60)(9.8) = \frac{1}{2}(.5)(1.2)(.25)v_t^2$

$\frac{588.6}{7848} = \frac{.075}{7848}v_t^2$

$\sqrt{7848} = \sqrt{v_t^2}$

$88.58 = v_t^2$

b) 8.85 m/s

$A = .25(100) = 25 \text{ m}^2$

$588.6 = \frac{1}{2}(.5)(1.2)(25)v_t^2$

$\frac{588.6}{78.48} = \frac{7.5}{78.48}$

$\sqrt{78.48} = \sqrt{v_t^2}$

$8.85 = v_t$