Midterm

2. 1a) $S = \dfrac{d}{t}$ $= \dfrac{0.5km}{1.5\,sec} \Big| \dfrac{1000m}{1\,km}$

$= \boxed{333.33\,m/s}$

b. $\dfrac{0.5km}{5\,sec} \Big| \dfrac{60\,sec}{1\,min} \Big| \dfrac{60\,min}{1\,hr}$ $= \boxed{1200\,km/hr}$

2a. $0.25m^3 \Big| \dfrac{100cm}{m} \Big| \dfrac{100cm}{m} \Big| \dfrac{100cm}{m}$ $= \boxed{250,000\,cm^3}$

b. $\dfrac{100km}{hr} \Big| \dfrac{1000m}{1km} \Big| \dfrac{1\,hr}{60\,min} \Big| \dfrac{1\,min}{60\,sec}$ $= \boxed{27.78\,m/s}$

c. $\dfrac{2\,kg\,m}{s^{-2}} \Big| \dfrac{1000g}{1kg} \Big| \dfrac{100cm}{1m} \Big| \dfrac{1s}{1000ms} \Big| \dfrac{1s}{1000ms}$ $= \boxed{\dfrac{0.2\,g\,cm}{ms^2}}$

3. 1a
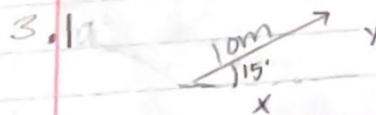
$\sin(15°) = \dfrac{y}{10} = 2.59m$

$\cos(15°) = \dfrac{x}{10} = 9.66m$

$\boxed{9.66\hat{\imath} + 2.59\hat{\jmath}}$
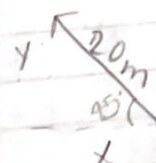
$\sin(45°) = \dfrac{y}{20} = 14.14m$

$\cos(45°) = \dfrac{x}{20} = -14.14m$

$\boxed{-14.14\hat{\imath} + 14.14\hat{\jmath}}$

2.
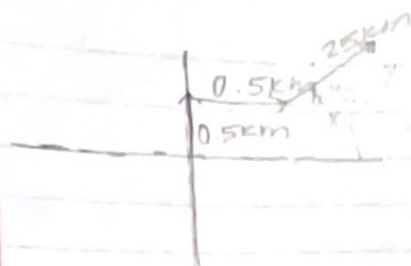
$$\frac{y}{0.25} = \sin(45)° = 0.18\ km$$

$$\frac{x}{0.25} = \cos(45°) = 0.18\ km$$

$x\hat{\imath}$	$y\hat{\jmath}$
0.18km	0.18km
0.5km	0.5km
0.68	0.68

$$\boxed{0.68\hat{\imath} + 0.68\hat{\jmath}}$$

Distance $= 0.5 + 0.5 + 0.25$
$$= \boxed{1.25\ km}$$

4. 1 $x(t) = -1.0 - 40t\ m$

a) $\Delta x = xf - xi$

$xp = x(2) = -1.0 - 40(2)\ m = -9.0\ m$

$xi = x(-2) = -1.0 - 4.0(-2)\ m = 7.0\ m$

$$\Delta x = -9.8 - 7.0m = \boxed{-16.0m}$$

b) $v = \frac{x}{t} = \frac{-16.0m}{4s} = \boxed{-4.0\ m/s}$

$2 - (-2) = 4$

2. $x(t) = -2t + 7t^2$

a) $v = \frac{\Delta x}{\Delta t} = \frac{x(2) - x(0)\ m}{2 - 0\ s} = \frac{24m - 0m}{2s} = \frac{24m}{2s} = \boxed{12\ m/s}$
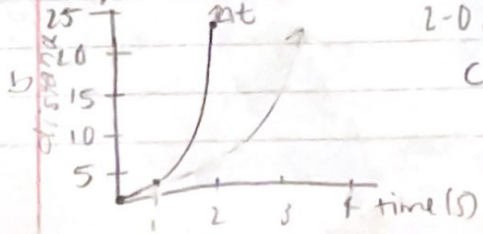
c) $\dfrac{-2(1) + 7(1)^2\ m}{1\ s} = 5\ m/s$

a) $a = \dfrac{\Delta v}{\Delta t} = \dfrac{12\,m/s}{2.0\,s} = \boxed{6\,m/s^2}$

3.) $a = 5.0\,m/s^2 \qquad v_i = 0\,m/s$

a) $a = \dfrac{\Delta x}{\Delta t} \qquad 5.0\,m/s^2 = \dfrac{10\,m/s}{\Delta t} \qquad \Delta t = \dfrac{10\,m/s}{5.0\,m/s^2} = \boxed{2\,s}$

b) $x(t) = \dfrac{1}{2}(5.0\,m/s^2)(2\,s^2) + (0\cdot 2\,s) + 0$

$\boxed{x(t) = 10\,m}$

c) $100\,m - 10\,m = 90\,m$
$10\,m/s = 90\,m/t$
$10x = 90$
$x = 9$

$9s + 2s = \boxed{11\,s}$

5.) 1.

162.5 m / 75m

b.

170.97 m / 75m / 162.5 m
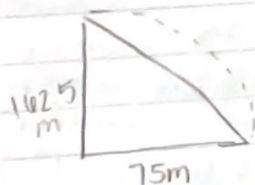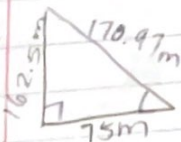
$162.5^2 + 75^2 = x^2$
$x = 178.97$
$\theta \tan(\theta) = \dfrac{162.5\,m}{75\,m} = 65.22°$

$R = \dfrac{V_0^2 \sin(2\theta_0)}{g}$

$75\,m = \dfrac{V_0^2 \sin(2\cdot 65.22)}{9.8\,s}$

$V_0 = 31.08\,m/s$

$V_{x,i} = V_0 \cos(\theta)$
$V_x\uparrow = 31.08\,m/s \cdot \cos(65.22)$
$\boxed{V_x\uparrow = 13.08\,m/s}$

2

a. $R = \dfrac{V_0^2 \sin(2\theta_0)}{g} = \dfrac{(40 \text{ m/s})^2 \sin(2 \cdot 45)}{9.8} = \boxed{163.26 \text{ m}}$
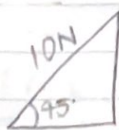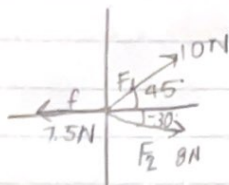
b) $x(t) = (x_i + v_{xi} t) \uparrow$

$163.26 \text{ m} = 0\text{m} + 40 \text{ m/s} \cdot t$

$\boxed{4.00 \text{ s} = t}$

c. $m = 49. \text{ kg}$ $\vec{F} \text{ net} = m\vec{a}$

$\vec{N} = mg$

$X = 7.1 N + 6.9 N = 14 N$

$Y = 7.1 N + (-4.0 N) = 3.1 N$

$\cos(45°) \cdot 10 = 7.1 N$
$\sin(45°) \cdot 10 = 7.1 N$
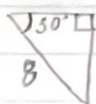
$\cos(30°) \cdot 8 = 6.9 N$
$\sin(30°) \cdot 8 = -4.0 N$

$x^2 = 14.0^2 + 3.1^2$
$x = 14.3 N$

$\tan \dfrac{3.1N}{14.0 N}$
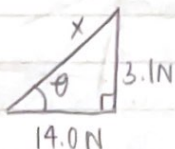
$\theta = 12°$

$\dfrac{14.3 - 7.5}{49.0} = \dfrac{49.0 - a}{49.0}$

$a = \dfrac{6.8}{49.0} = \boxed{0.14 \text{ m/s}^2}$