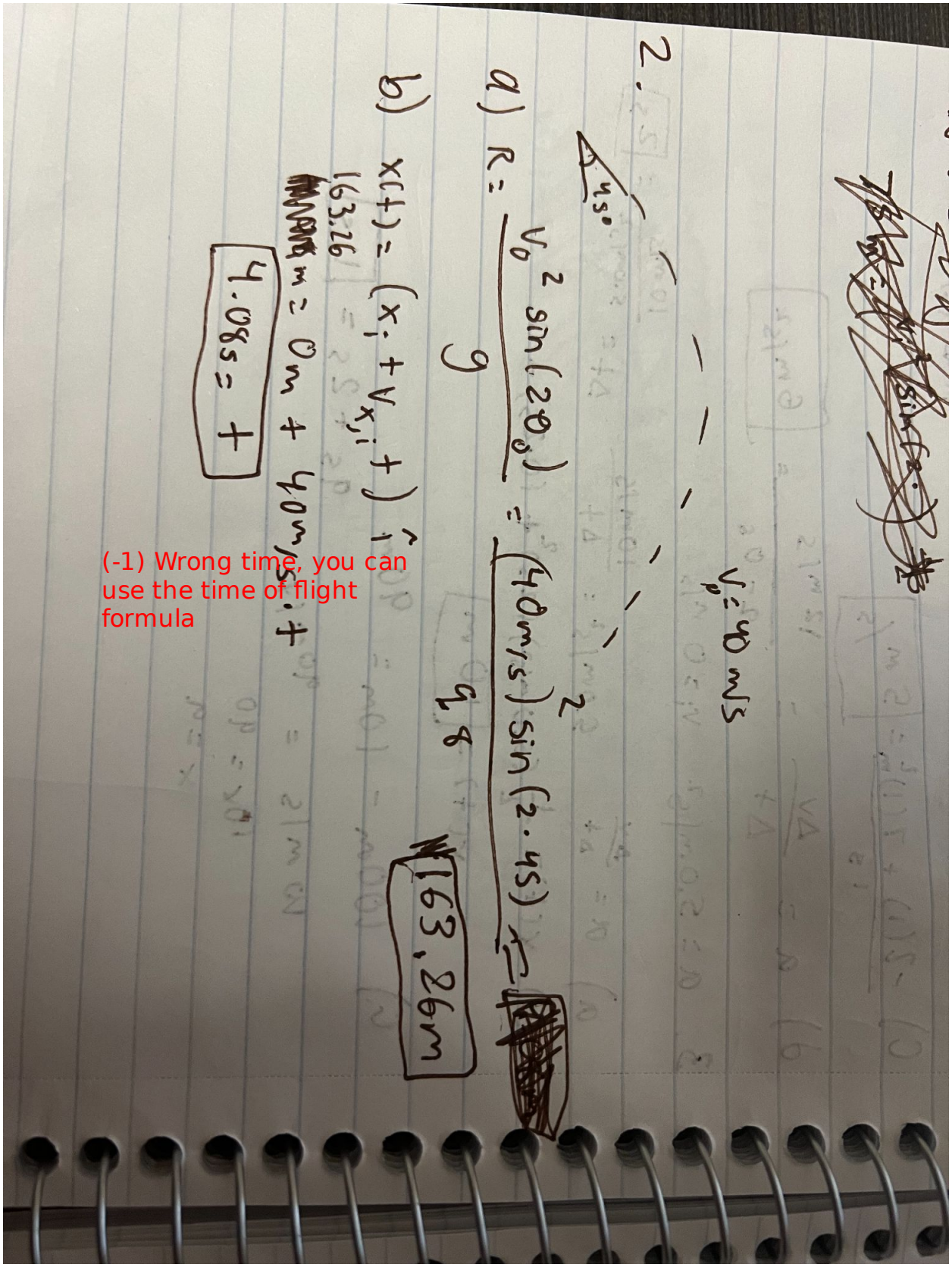
Charlotte Umstead

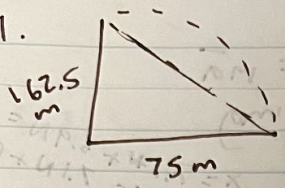
Score: 22/25 + many bonus points, equals 100 percent



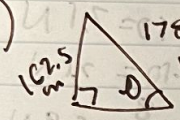
(-1) Wrong time, you can use the time of flight formula

5 1.

a)



b)



$162.5^2 + 75^2 = x^2$

$x = 178.97$

$\theta = \tan(\theta) = \frac{162.5\,m}{75m} = 65.22^\circ$

[illegible]

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

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

$V_0 = 31.08\,m/s$

$V_{x,i} = V_0 \cos(\theta)$

$V_{x,i} = 31.08\,m/s \cdot \cos(65.22^\circ)$

$\boxed{V_{x,i} = 13\,m/s}$

Very clever, though technically an approximation, well done.

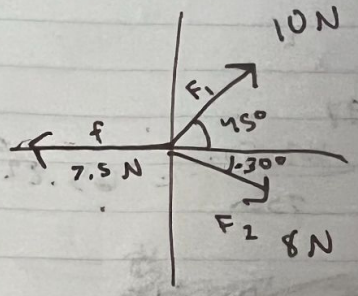
5 1. b

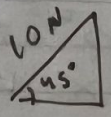
6

1. $m = 49.0\,kg$

$\vec{F}_{NET} = m\vec{a}$

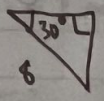
$\vec{W} = mg$





$\cos(45°) \cdot 10 = 7.1\,N$

$\sin(45°) \cdot 10 = 7.1\,N$

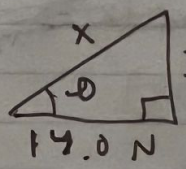


$\cos(30°) \cdot 8 = 6.9\,N$

$\sin(30°) \cdot 8 = -4.0\,N$

$x = 7.1\,N + 6.9\,N = 14\,N$

$y = 7.1\,N + (-4.0\,N) = 3.1\,N$



$\tan\theta = \frac{3.1\,N}{14.0\,N}$

$\theta = 12°$

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

$x = 14.3\,N$

$$\frac{14.3 - 7.5}{49.0} = \frac{49.0 \cdot a}{49.0}$$

$$a = \frac{6.8}{49.0} = \boxed{0.14\,m/s^2}$$

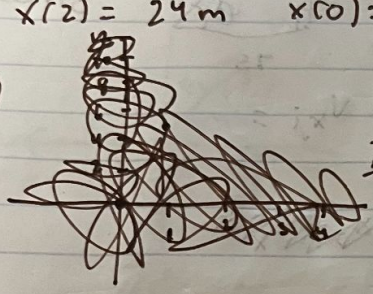
Nice!

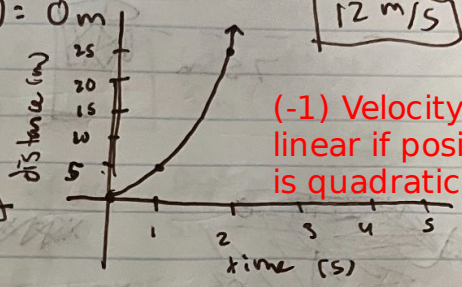
2. $x(t) = -2t + 7t^2$

a) $v = \frac{\Delta x}{\Delta t} = \frac{x(2) - x(0)\,m}{2 - 0\,s} = \frac{24\,m - 0\,m}{2\,s} = \frac{24\,m}{2\,s} =$ **12 m/s**

$x(2) = 24\,m$ $x(0) = 0\,m$

b)





(-1) Velocity is linear if position is quadratic

c) $\frac{-2(1) + 7(1)^2\,m}{1\,s} =$ **5 m/s**

(-1) Velocity is changing

d) $a = \frac{\Delta v}{\Delta t} = \frac{12\,m/s}{2 - 0\,s} =$ **6 m/s²**

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

a) $a = \frac{\Delta v}{\Delta t}$ $5.0\,m/s^2 = \frac{10\,m/s}{\Delta t}$ $\Delta t = \frac{10\,m/s}{5.0\,m/s^2} =$ **2 s**

b) $x(t) = \frac{1}{2}(5.0\,m/s^2)(2\,s)^2 + (0.2s) + 0$

$x(t) =$ **10 m**

c) $100\,m - 10\,m = 90\,m$

$9s + 2s =$ **11 s**

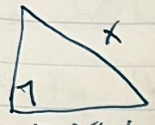
$10\,m/s = 90\,m/x$

$10x = 90$

$x = 9$

Well done

c)



$0.68^2 + 0.68^2 = x^2$

$x = \boxed{0.96 \text{ km}}$

4

1. $x(t) = -1.0 - 4.0t$ m

a) $\Delta x = x_f - x_i$

$x_f = x(2) = -1.0 - 4.0(2)\text{ m} = -9.0\text{ m}$

$x_i = x(-2) = -1.0 - 4.0(-2)\text{ m} = 7.0\text{ m}$

$\Delta x = -9.0 - 7.0\text{ m} = \boxed{-16.0\text{ m}}$

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

$2 - (-2) = 4$

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

a) $x(2) = 26\text{m}$ $\quad x(0) = -2$

$x_f - x_i$

$26\text{m} - (-2\text{m}) = \boxed{28\text{m}}$

$x(2) \quad x(0)$

$2 - 0\text{s}$

$26\text{m} - (-2\text{m})$

2s

$\frac{28\text{m}}{2\text{s}} = \boxed{14\text{m/s}}$

physics midterm

2

1. $t = 1.5\,s$ $\quad x = 0.5\,km$

a) $s = \frac{d}{t}$ $\quad 0.5\,km \cdot 1000\,m = 500\,m$

$\frac{500\,m}{1.5\,s} = \boxed{333\,m/s}$

b) $\frac{0.5\,km}{1.5\,s} \cdot \frac{60\,s}{1\,min} \cdot \frac{60\,min}{1\,hour} = \boxed{1200\,km/hr}$

2. a) $0.25\,m^3 \cdot \frac{100\,cm}{m} \cdot \frac{100\,cm}{m} \cdot \frac{100\,cm}{m} = \boxed{250{,}000\,cm^3}$

b) $\frac{100\,km}{1\,hour} \cdot \frac{1\,hour}{60\,min} \cdot \frac{1\,min}{60\,s} \cdot \frac{1000\,m}{1\,km} = \boxed{\frac{27.78\,m}{s}}$

c) $\frac{2\,kg\,m}{s^2} \cdot \frac{1000\,g}{1\,kg} \cdot \frac{100\,cm}{1\,m} \cdot \frac{1\,s}{1000\,ms} \cdot \frac{1\,s}{1000\,ms} = \boxed{\frac{0.2\,g\,cm}{ms^2}}$

3

1. a) $x = \cos(15) \cdot 10\,m = 9.66\,m$

$y = \sin(15) \cdot 10\,m = 2.59\,m$

$\boxed{9.66\,m\hat{i} + 2.59\,m\hat{j}}$

b) $x = \cos(135) \cdot 20\,m = -14.14\,m$

$y = \sin(135) \cdot 20\,m = 14.14\,m$

$\boxed{-14.14\,m\hat{i} + 14.14\,m\hat{j}}$

2. a)

b) $x = \cos(45) \cdot 0.25\,km = 0.18$

$y = \sin(45) \cdot 0.25\,km = 0.18$

$0.5\,km\hat{j} + 0.5\,km\hat{i} + 0.18\hat{i} + 0.18\hat{j} =$

$\boxed{0.68\,km\hat{i} + 0.68\,km\hat{j}}$