Dept. of Physics

PCS 211 – Fall 2021
Tutorial Report Cover Page

Group's Students Info

Student Full Name	Student # (Last 4 digits)
Amaan Asim	6887
Amelia Mangat	4578
Hamza Ejaz Malik	2545
Sugen Jeyakumar	7111

Tutorial Number : ____4_____

Tutorial Date : ____October 26th, 2021_____

Tutorial TA Name : _____Matt Bielecki_____

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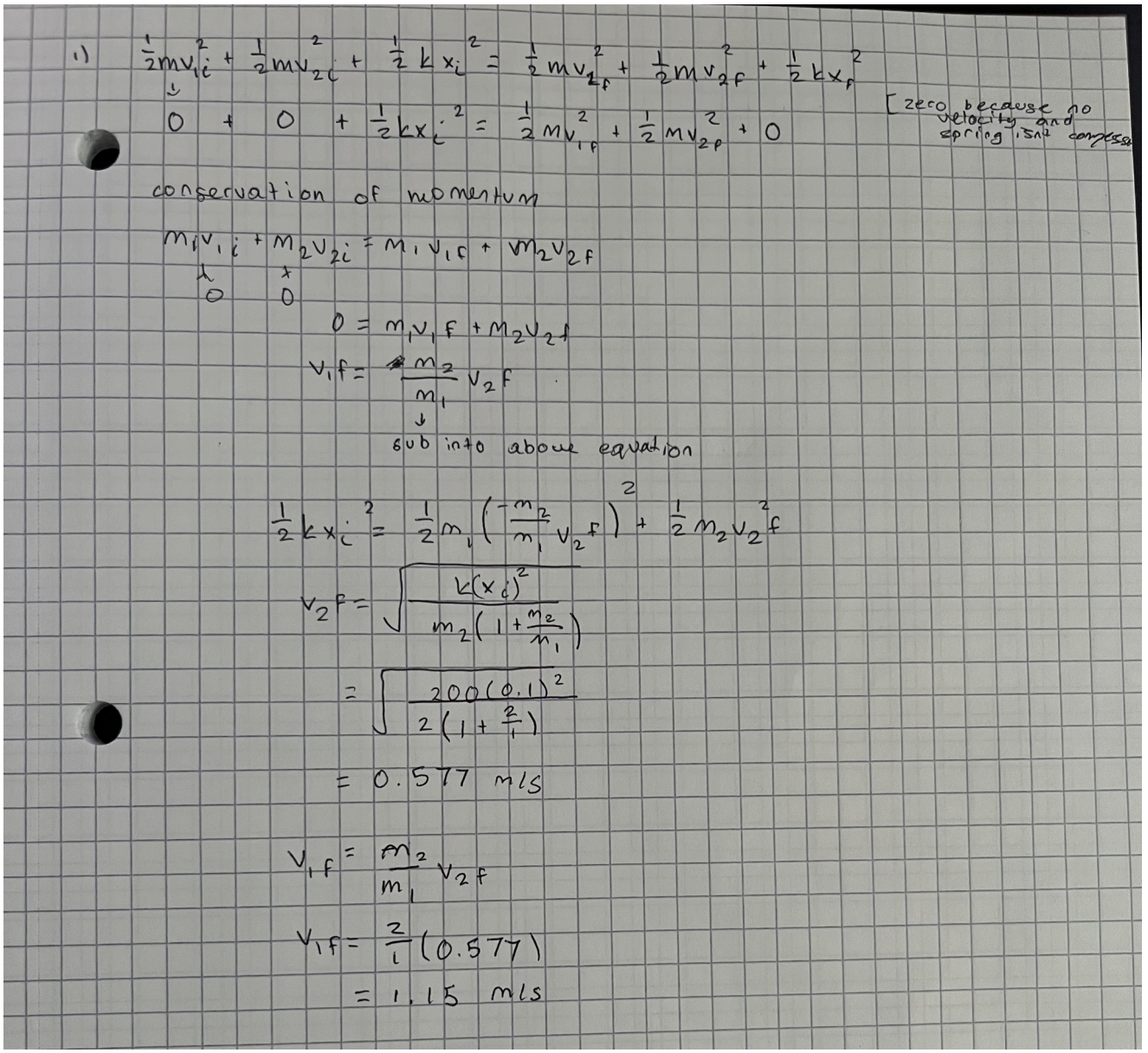
1. .



i) $\frac{1}{2}mv_{1i}^2 + \frac{1}{2}mv_{2i}^2 + \frac{1}{2}kx_i^2 = \frac{1}{2}mv_{1f}^2 + \frac{1}{2}mv_{2f}^2 + \frac{1}{2}kx_f^2$

$0 + 0 + \frac{1}{2}kx_i^2 = \frac{1}{2}mv_{1f}^2 + \frac{1}{2}mv_{2f}^2 + 0$

[zero because no velocity and spring isn't compressed]

conservation of momentum

$m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$

$0 \quad 0$

$0 = m_1v_{1f} + m_2v_{2f}$

$v_{1f} = \frac{m_2}{m_1}v_{2f}$

sub into above equation

$\frac{1}{2}kx_i^2 = \frac{1}{2}m_1\left(\frac{-m_2}{m_1}v_{2f}\right)^2 + \frac{1}{2}m_2v_{2f}^2$

$v_{2f} = \sqrt{\frac{k(x_i)^2}{m_2\left(1+\frac{m_2}{m_1}\right)}}$

$= \sqrt{\frac{200(0.1)^2}{2\left(1+\frac{2}{1}\right)}}$

$= 0.577 \text{ m/s}$

$v_{1f} = \frac{m_2}{m_1}v_{2f}$

$v_{1f} = \frac{2}{1}(0.577)$

$= 1.15 \text{ m/s}$

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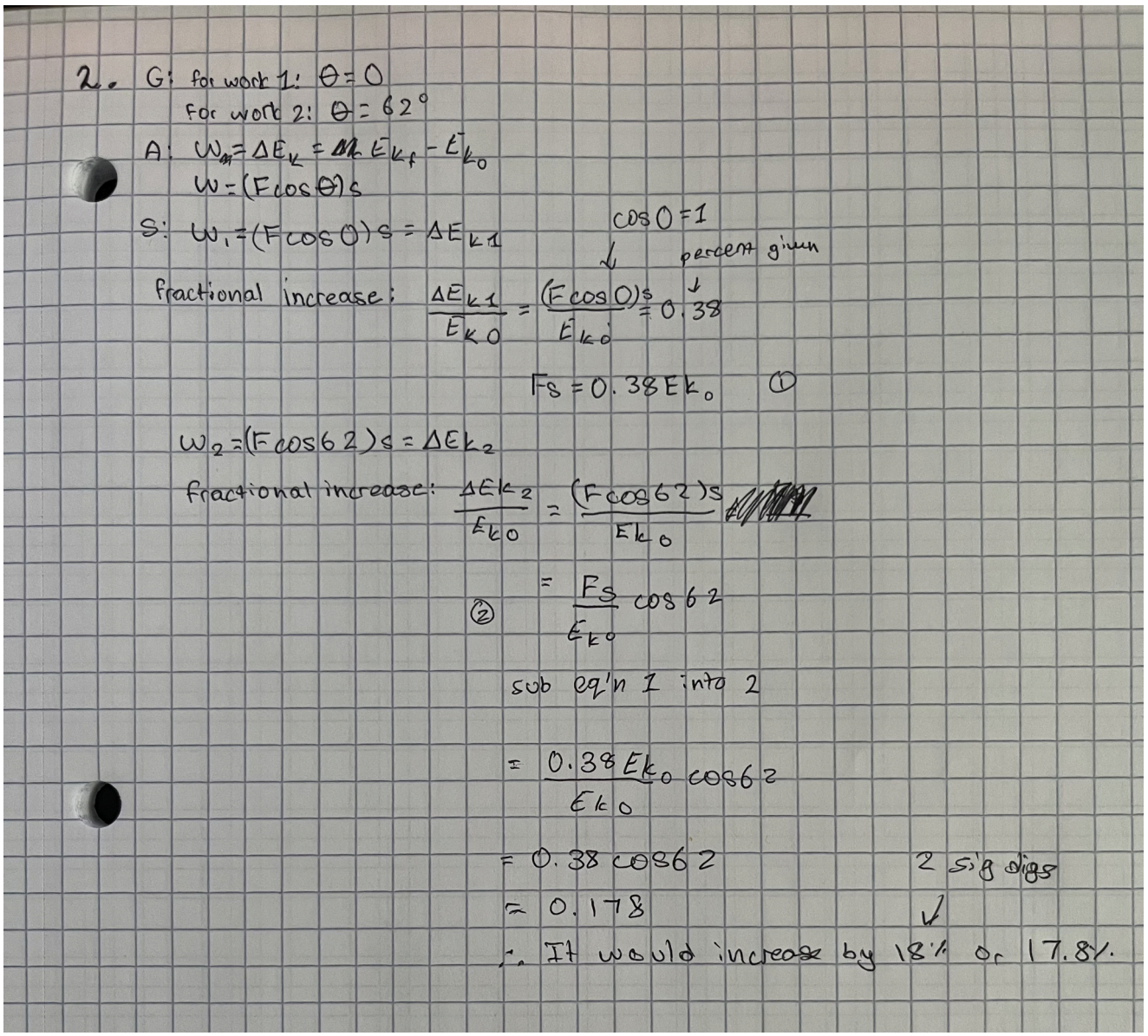
2. .



2. G: for work 1: $\theta = 0$
for work 2: $\theta = 62°$

A: $W_{net} = \Delta E_K = E_{Kf} - E_{K0}$
$W = (F\cos\theta)s$

S: $W_1 = (F\cos 0)s = \Delta E_{K1}$ ($\cos 0 = 1$)

fractional increase: $\frac{\Delta E_{K1}}{E_{K0}} = \frac{(F\cos 0)s}{E_{K0}} = 0.38$ (percent given)

$Fs = 0.38 E_{K0}$ ①

$W_2 = (F\cos 62)s = \Delta E_{K2}$

fractional increase: $\frac{\Delta E_{K2}}{E_{K0}} = \frac{(F\cos 62)s}{E_{K0}}$

② $= \frac{Fs}{E_{K0}}\cos 62$

sub eq'n 1 into 2

$= \frac{0.38 E_{K0}}{E_{K0}}\cos 62$

$= 0.38\cos 62$ (2 sig figs ✓)

$= 0.178$

∴ It would increase by 18% or 17.8%.

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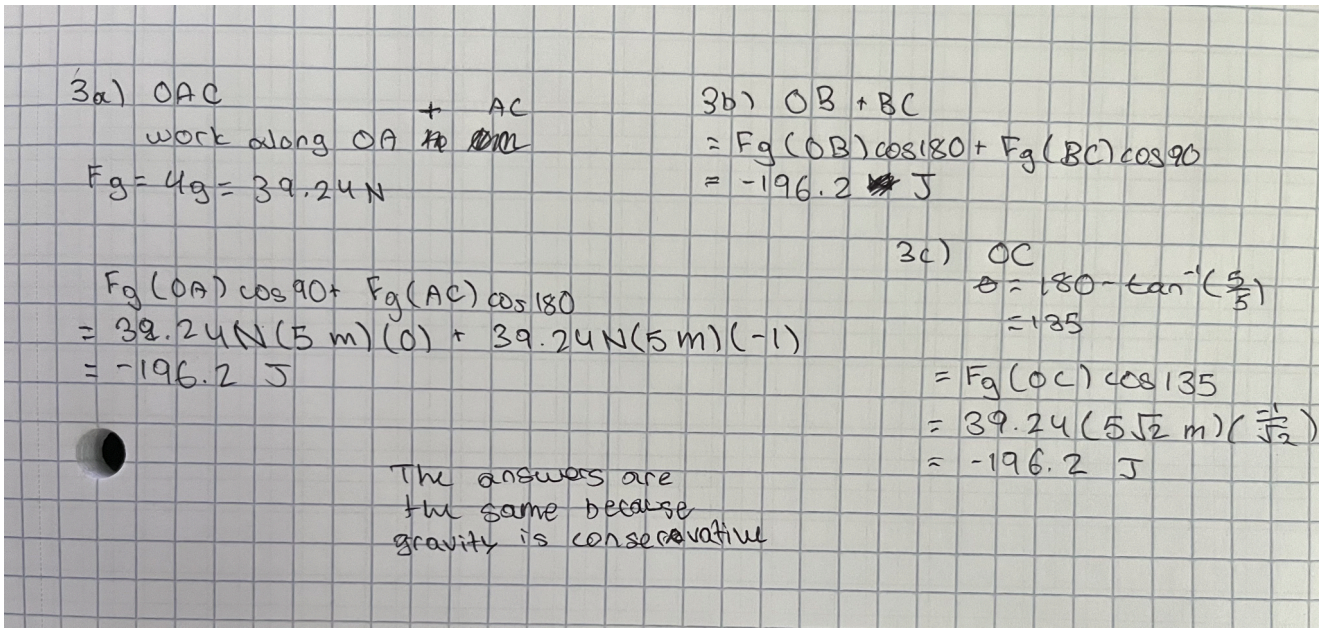
3. 

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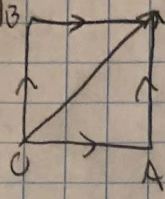
4

$F = (2y\,i + x^2\,j)$ N



a) $W = F\cos\theta\,\Delta r$

$W_{net} = W_1 + W_2$

$W_{net} = (2y)(5)(\cos 0) + x^2(5)(\cos\theta)$

$= 10y\,i + 5x^2\,j$

b) $W_{net} = W_1 + W_2$

$= 2y(5)(\cos 0) + x^2(5)(\cos\theta)$

$= 10y\,i + 5x^2\,j$

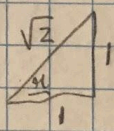
c) $W_{net} = W_1$

$= F\cos\theta\,\Delta r$ $\qquad \Delta r = \sqrt{5^2 + 5^2}$

$= (2y\,i + x^2\,j)(\cos 45)(5\sqrt{2}) = 5\sqrt{2}$

$= (2y\,i + x^2\,j)\left(\frac{1}{\sqrt{2}}\right)(5\sqrt{2})$

$= 10y\,i + 5x^2\,j$



d) yes the force is conservative because regardless of the path taken from point O → C, I keep getting the same work value

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5.