Physics 4A
Fall 2025

ave. = 6.2
σ = 2.3

Name Answer Key

Lab: 8:00 am 11:20 am 2:40 pm (circle one)

Quiz #7: Work and Kinetic Energy

Problem 1 (2 points)
Two equal-mass pucks on frictionless ice are pushed towards each other by two equal but opposite forces. Is the total work on both pucks positive, negative, or zero?

A

a) positive
b) negative
c) zero

work done by each force is positive since $\theta = 0°$

Problem 2 (2 points) (3 pts)
Two position vectors and given by $\vec{A} = (5.00\text{ m})\hat{i} - (2.00\text{ m})\hat{j} - (3.00\text{ m})\hat{k}$ and $\vec{B} = (3.25\text{ m})\hat{i} - (6.0\text{ m})\hat{k}$. What is the scalar product of $(3\vec{A})\cdot\vec{B}$?

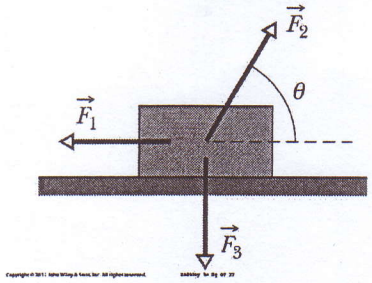
$3\vec{A} = (15.00\text{m})\hat{i} - (6.00\text{m})\hat{j} - (9.00\text{m})\hat{k}$ $\quad \vec{B} = (3.25\text{m})\hat{i} + 0\hat{j} - (6.00\text{m})\hat{k}$

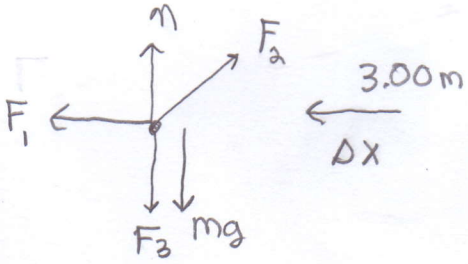
$\vec{A}\cdot\vec{B} = A_x B_x + A_y B_y + A_z B_z$

$= (15.0\text{m})(3.25\text{m}) + (-6.00\text{m})(0) + (-9.00\text{m})(-6.00\text{m}) = \boxed{103\text{ m}^2}$

$= \boxed{1.0\times10^{1}\text{ m}^2}$

Problem 3 (5 points)
The figure below shows three forces applied to a 5.0 kg trunk that moves *leftward* by 3.00 m over a frictionless floor. The force magnitudes are $F_1 = 5.00$ N, $F_2 = 9.00$ N, and $F_3 = 3.00$ N, and the indicated angle is $\theta = 60.0°$. During the displacement, **(a)** What is the net work done on the trunk by all forces (including the normal force and gravity)? **(b)** If the trunk was initially at rest, what is its final speed after being displaced 3.00 m?





(a) $W_{net} = W_{F_1} + W_{F_2} + W_{F_3} + W_g + W_n = W_{F_1} + W_{F_2}$

$W_{F_3} = 0$ since $\theta = 90°$

$W_{net} = F_1 \Delta x \cos 0° + F_2 \Delta x \cos 120°$

$= (5.00\text{m})(3.00\text{m})\cos 0° + (9.00\text{m})(3.00\text{m})\cos 120° = \boxed{1.50\text{ J}}$

(b) $W_{tot} = \frac{1}{2}mv_f^2 - \underbrace{\frac{1}{2}mv_i^2}_{0} \rightarrow v_f = \sqrt{\frac{2W_{tot}}{m}} = \sqrt{\frac{2(1.50\text{J})}{5.00\text{kg}}} = \boxed{0.77\text{ m/s}}$