5. $K_F = \frac{1}{2} K_S$ $\quad K = \frac{1}{2} m v^2$

$m_F = 2m$

$m_S = m$

$$\frac{1}{2}(2m) V_F^2 = \frac{1}{2}\left(\frac{1}{2} m V_S^2\right)$$

$$m V_F^2 = \frac{1}{4} m V_S^2$$

$$V_f^2 = \frac{1}{4} V_S^2 \qquad V_f = \frac{1}{2} V_S$$

$$\tfrac{1}{2}(2m)(V_F+1)^2 = \tfrac{1}{2} m V_S^2$$

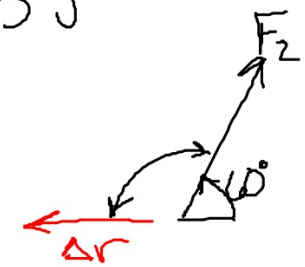
$$m(V_F^2 + 2V_F + 1) = \tfrac{1}{2} m V_S^2$$

$$\frac{1}{4} V_S^2 + V_S + 1 = \tfrac{1}{2} V_S^2 \qquad 0 = \frac{1}{4} V_S^2 - V_S - 1$$

$V_S = 4.8 \text{ m/s}$ $\quad V_f = 2.4 \text{ m/}$

15. $W_{net} = ?$ $\quad W = (F)(\Delta r)\cos\Phi$

$W_1 = (5)(3)\cos 0^\circ = 15\,J$



$W_2 = (9_N)(3_m)\cos 120^\circ$

$= -13.5\,J$

$W_3 = 0 \quad (\theta = 90^\circ)$

$W_{total} = 1.5\,J$

K increases!

9. $W_{net} = ?$ $\Sigma F = 5N$ $V_o = 4 m/s\ 0^\circ$

$m = 2kg$ $V_f = 6 m/s\ 90^\circ$

$$W_{net} = \Delta K = K_f - K_i$$

$$= \tfrac{1}{2} m v_f^2 - \tfrac{1}{2} m V_o^2 = \tfrac{1}{2} m \left(V_f^2 - V_o^2 \right)$$

$$= \tfrac{1}{2}(2)(36 - 16)$$

$$W_{net} = 20 J$$

2. $K = ?$

$$K = \tfrac{1}{2}mv^2 = \tfrac{1}{2}(2.9 \times 10^5)(11.2 \times 10^3)^2$$

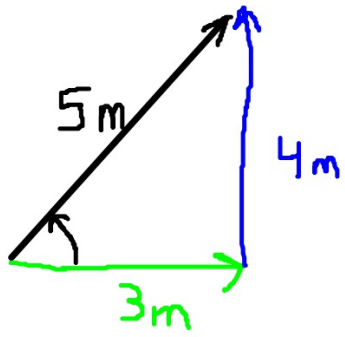
$$= 1.82 \times 10^{13}\ \text{J}$$

$$= 18.2\ \text{TJ}$$

10. $W = ?$

$\vec{F} = 2\ N, 100^\circ$

$\vec{\Delta r} = 5m, 53^\circ$



$W = \vec{F} \cdot \vec{\Delta r} = (F)(\Delta r)\cos\phi$

$= (2)(5)\cos 47^\circ = 6.82J$