1.

a. 4N / 0.2kg = 20 m/s^2

b. 4N · 12s = 48 N·s

c. $\Delta t = \frac{120\frac{m}{s}}{20\frac{m}{s^2}}$ = 6s

d. $v = 20m/s^2 \cdot 8s$ = 160 m/s

e. Area = 16 kg·m/s

f. c would increase, a and d would decrease

2.

a. Area = 12 N·s

b. 12 N·s / 5kg = 2.4 m/s

c. i. $\frac{13\ kg \cdot \frac{m}{s} - 12N \cdot s}{0.5kg}$ = 2 m/s

ii. right

d. $[\frac{1}{2}(5)(2.4^2) + \frac{1}{2}(0.5)(2.0^2)] - \frac{1}{2}(0.5)(26^2)$ = -153.6 J

e. (2.4m/s)(0.495s) – (2.0m/s)(0.495s) = 0.198 m

3.

a. $\frac{-0.18\frac{m}{s} - 0.22\frac{m}{s}}{0.04s}$ -10 m/s^2

b. Area = 0.6 N·s

c. $\frac{-0.6\ \text{N}\cdot\text{s}}{-0.18\frac{m}{s} - 0.22\frac{m}{s}}$ = 1.5 kg

d. $\frac{1}{2}(1.5)(-0.18)^2 - \frac{1}{2}(1.5)(0.22)^2$ = 0.012J

4.

a. $6\text{kg}\cdot\text{m/s} - 5\text{N}\cdot\text{s}$ $\frac{6\text{kg}\cdot\text{m/s} - 5\text{N}\cdot\text{s}}{2kg} = 0.5\text{m/s}$

b. $\frac{5N\cdot s}{1.6\ m/s} = 3.125\text{kg}$

c. $\frac{0.5\frac{m}{s} - 1.6\frac{m}{s}}{1.5s} = -0.73\ \text{m/s}^2$

d. Area = 5.525m

e. The ramp goes up to an elevation of 0.118m

$(3.125)(9.8)(0) + \frac{1}{2}(3.125)(1.6^2) = (3.125)(9.8)(h) + \frac{1}{2}(3.125)(0.5^2)$

f. A steeper ramp would create a higher negative acceleration, but the equation above would still apply by conservation of energy, so the final velocity would remain the same.

5.

a.

$K = \frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2}(2.2 \times 10^{14})(879^2) = 8.5 \times 10^{19} J$

$U_G = \frac{-G \cdot m_{sun} \cdot m_{comet}}{R} = \frac{-(6.67E-11)(1.99E30)(2.2E14)}{(35.1)(1.496E11)} = -5.56 \times 10^{21} J$

$E_{total} = K + U_G = -5.476 \times 10^{21} J$

b.

$U_G = \frac{-G \cdot m_{sun} \cdot m_{comet}}{R} = \frac{-(6.67E-11)(1.99E30)(2.2E14)}{(0.586)(1.496E11)} = -3.33 \times 10^{23} J$

$K = E_{total} - U = -5.476 \times 10^{21} - (-3.33 \times 10^{23} J) = 3.276 \times 10^{23} J$

c.

$3.276 \times 10^{23} J = \frac{1}{2}(2.2 \times 10^{14})(v^2)$

$v = 54{,}574 m/s$

d. $W = \Delta K = K_f - K_i = 3.276 \times 10^{23} J - 8.5 \times 10^{19} J = 3.275 \times 10^{23} J$