PS 161 Exam 3 Formulas

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$$W = \int_{x_1}^{x_2} \vec{F} \cdot \mathrm{d}\vec{s} = W_{\text{cons}} + W_{\text{nc}} = \Delta K = \left(\frac{1}{2} m v^2 \quad \text{or} \quad \frac{p^2}{2m} \right) \Bigg|_{x_1}^{x_2} \tag{1}$$

$$W_F^{\text{cons}} = -\Delta U_F \tag{2}$$

$$U_{\text{grav}} = mgy \qquad U_{\text{el}} = \frac{1}{2} k x^2 \tag{3}$$

$$J = \int_{t_1}^{t_2} F(t)\, \mathrm{d}t = \Delta p = mv \Big|_{t_1}^{t_2} = F_{\text{av}} \Delta t \tag{4}$$

$$F = -\vec{\nabla} U = m\dot{\vec{v}} \tag{5}$$

$$P_{\text{av}} = \frac{W}{\Delta t} \qquad P = \dot{W} = \vec{F} \cdot \vec{v} \tag{6}$$

$$\vec{p} = m\vec{v} \tag{7}$$

$$x_{\text{cm}} = \frac{\sum mx}{\sum m} \qquad \vec{v}_{\text{cm}} = \frac{\sum \vec{p}}{\sum m} \tag{8}$$

$$\Delta W = -\Delta U \tag{9}$$

$$v_{Af}, v_{Bf} = \frac{p_{Ai} + 2p_{Bi} - m_B v_{Ai}}{m_A + m_B}, \frac{p_{Bi} + 2p_{Ai} - m_A v_{Bi}}{m_A + m_B} \quad \text{(elastic)} \tag{10}$$