March 26, Week 10

Today: Chapter 8, Momentum

Homework #7:
Mastering Physics: 6 problems from chapter 7
Written Question: 7.60
Due tonight at 11:59pm

Homework #8:
Mastering Physics: 8 problems from chapter 8
Written Question: 8.101
Due April 2 at 11:59pm

General Energy Problems

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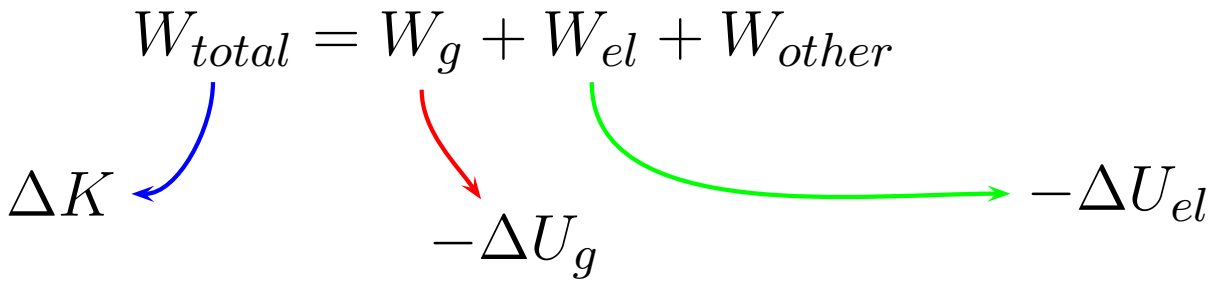

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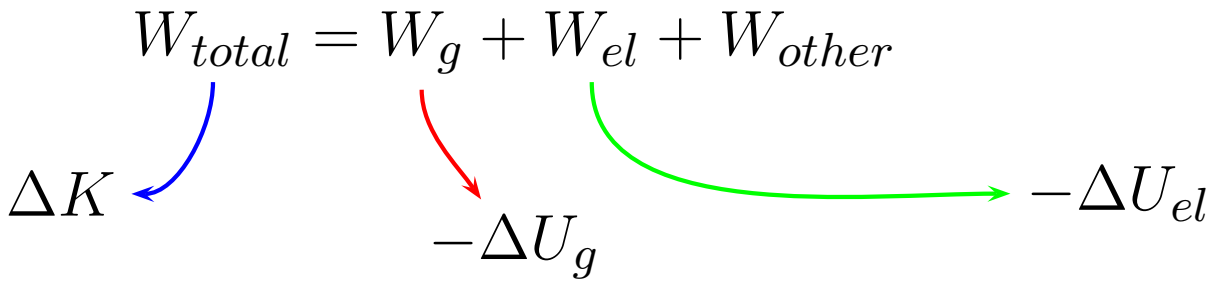

$$\frac{1}{2}Mv_1^2 + Mgy_1 + \frac{1}{2}ks_1^2 + W_{other} = \frac{1}{2}Mv_2^2 + Mgy_2 + \frac{1}{2}ks_2^2$$

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Example: A runaway $15\text{-}kg$ elevator hits a $k = 3000\,N/m$ safety-spring going $50\,m/s$, how far does it compress the spring?

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Average force $\Rightarrow$ constant force,

$$\vec{\mathbf{J}} = \int_{t_1}^{t_2} \vec{\mathbf{F}}_{av}\, dt = \vec{\mathbf{F}}_{av} \int_{t_1}^{t_2} dt = \vec{\mathbf{F}}_{av}\,(t_2 - t_1) \Rightarrow \boxed{\vec{\mathbf{J}} = \vec{\mathbf{F}}_{av}\Delta t}$$

Clicker Quiz

What is the average force on the 5-kg ball going $6\,m/s$ that bounces at $6\,m/s$ if the bouncing time is cut in half to $0.005\,s$?

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Impulse Example Continued

- What impulse is imparted to a 5-kg lump of clay that hits the ground going $6\,m/s$?