Oct 29: Find your new groups!
New group contract due Thursday on WebAssign

Get whiteboards.

Potential energy
\[ U = -\frac{GMm}{r} \]

Potential energy does not change if you come back to same point
Only depends on initial and final positions
\[ \Delta E = W_{net} + Q \]
Thermal Energy and Heat Capacity

\[ C = \frac{\Delta E_{\text{thermal}}}{\Delta T} \]

Specific heat capacity \( C = \frac{\Delta E_{\text{thermal}}}{m \Delta T} \)

Heat capacity \( C = 4.2 \text{ J/K g} \)
Ponderable: You have a pot containing 1000 g of water over a fire, and you are also stirring the water with a paddle. The fire adds $Q = 5000 \text{ J}$ into the water. You do $W = 2000 \text{ J}$ of work with the paddle.

What is the increase in energy of the water?

$$\Delta E = W + Q$$

$$E_f = E_i + W + Q$$

$$E_f - E_i = W + Q = 2000 \text{ J} + 5000 \text{ J} = 7000 \text{ J}$$

What is the change in temperature of the water?

$$C = \frac{\Delta E_{E_{\text{water}}}}{\Delta T} = 4.2 \frac{\text{J}}{\text{K}} \cdot \frac{1000 \text{ J}}{\text{K}} = \frac{7000 \text{ J}}{1000 \text{ g}}$$

$$\Delta T = 1.7 \text{ K}$$
\[ C = \frac{\Delta E_{\text{thermal}}}{\Delta t} \]
Heat Capacity

\[ \frac{\Delta E}{\Delta t} = \frac{330 J}{3.05 s} = 111 W \]

Tangible: Hang on tight

\[ c_{\text{al}} = 0.9 J/g \cdot K \]

\[ \Delta E_{\text{thermal}} = M c \Delta T = (36 g)(0.9 J/g K)(10 K) = 324 J \]

What is power output of hand?