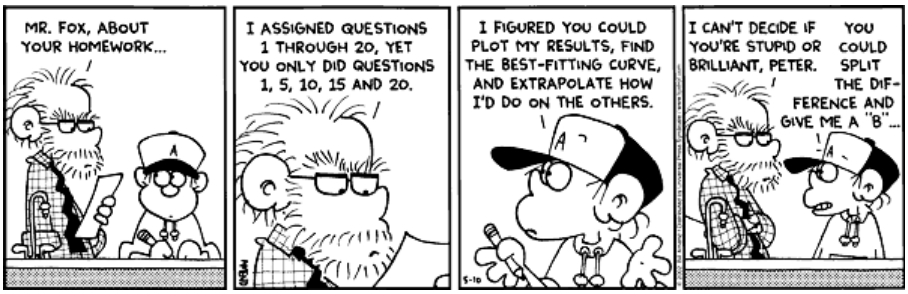
November 4, 2011 Physics 131 Prof. E. F. Redish

- **Theme Music: Joshua Bell**

  Nice work if you can get it

- **Cartoon: Bill Amend**

  FoxTrot



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Foothold ideas: Kinetic Energy and Work

- Newton's laws tell us how velocity changes. The Work-Energy theorem tells us how speed (independent of direction) changes.
- Kinetic energy = $\frac{1}{2}mv^2$
- Work done by a force = $F_x \Delta x$ or $F_{||} \Delta r$ (part of force || to displacement)
- Work-energy theorem: $\Delta(\frac{1}{2}mv^2) = F_{||}^{net}\ \Delta r$

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Foothold ideas: Potential Energy

- For some forces work only depends on the change in position. Then the work done can be written $\vec{F} \cdot \Delta\vec{r} = -\Delta U$

  U is called a *potential energy*.

- For gravity, $U_{gravity} = mgh$

  For a spring, $U_{spring} = \frac{1}{2} kx^2$

  For electric force, $U_{electric} = k_C Q_1 Q_2 / r_{12}$

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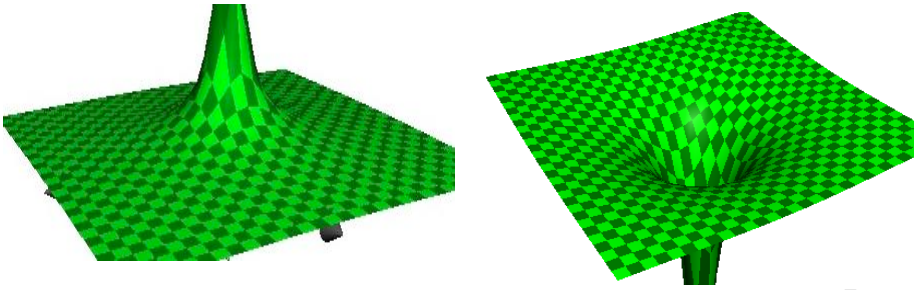
Electric PE of a Point Charge

$\Delta U_E = -\vec{F} \cdot \Delta\vec{r}$

= work done moving charge against force

$$U_{qQ} = \frac{k_C qQ}{r}$$



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