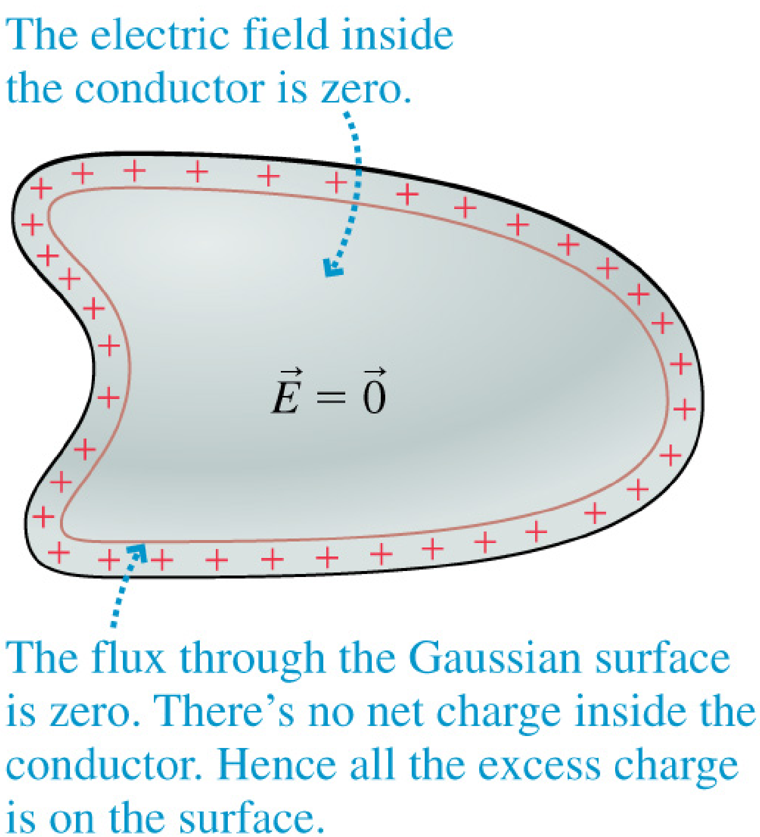
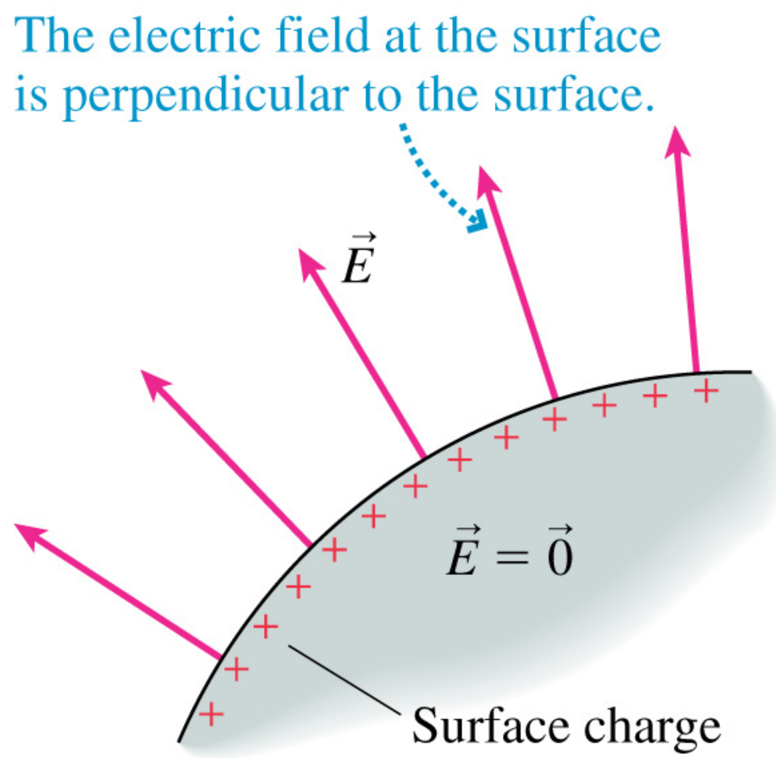
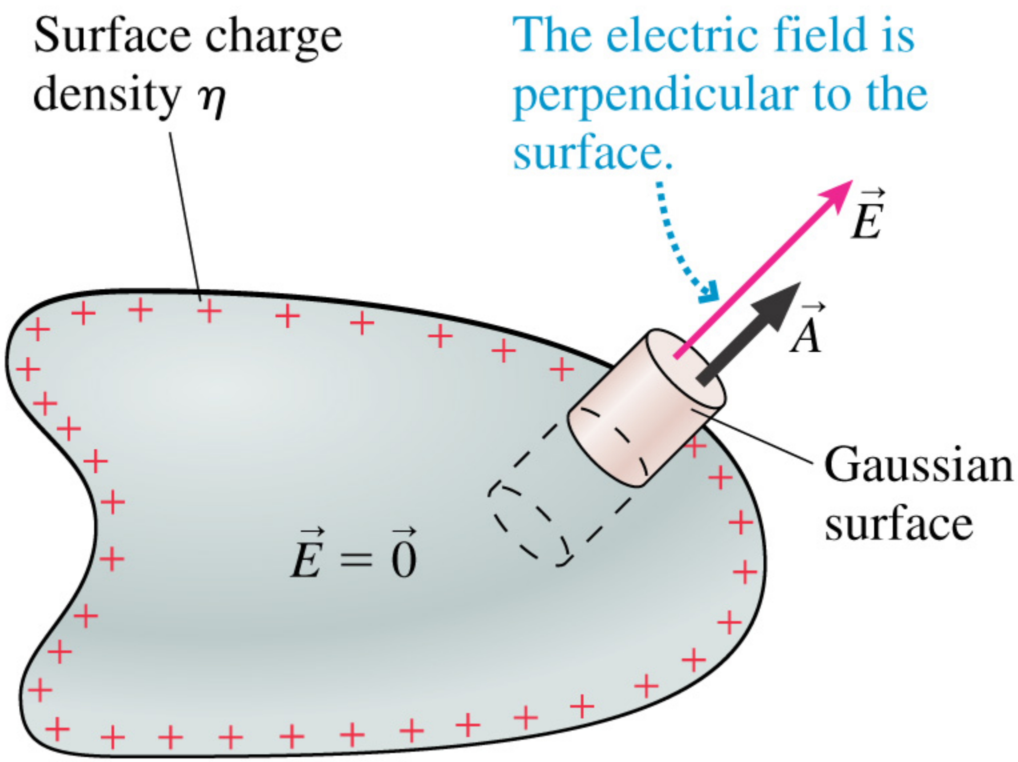
Lecture 7: Chapter 27, September 15 2005

Conductors in Electric Field: Related to Quiz 3





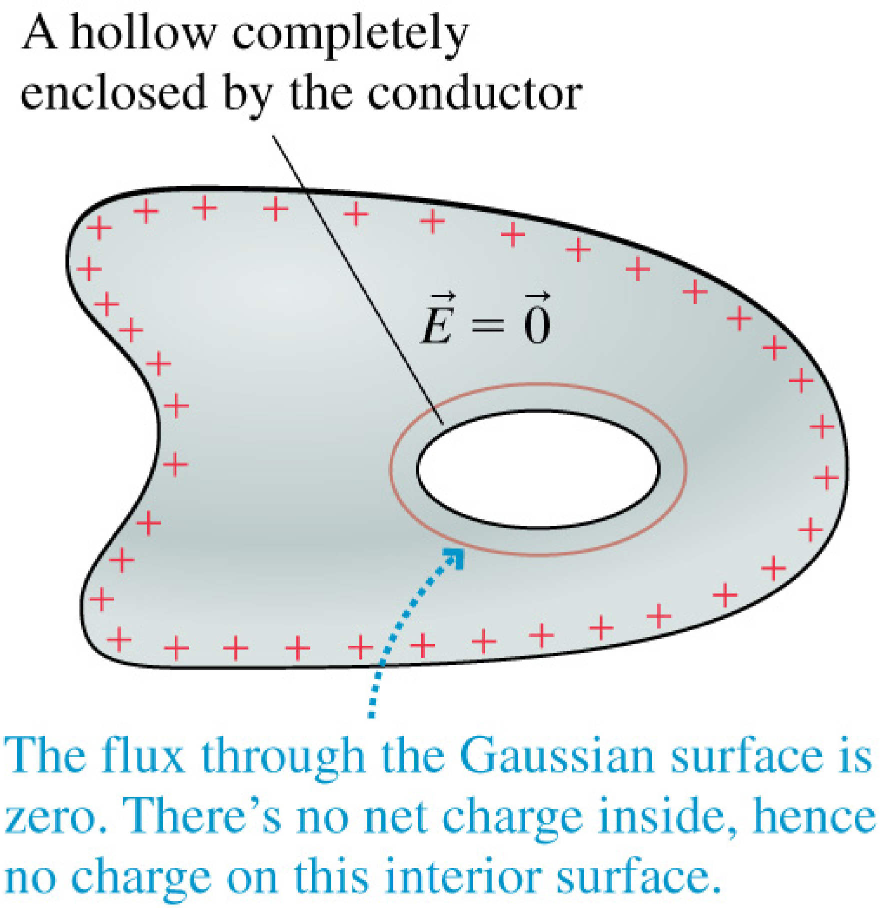
Electric Field at the Surface of Conductor



$\Phi_e = A\, E_{surface} = Q_{in}/\varepsilon_0 = \eta A/\ \varepsilon_0$

$E_{surface} = \eta/\ \varepsilon_0$, perpendicular to surface

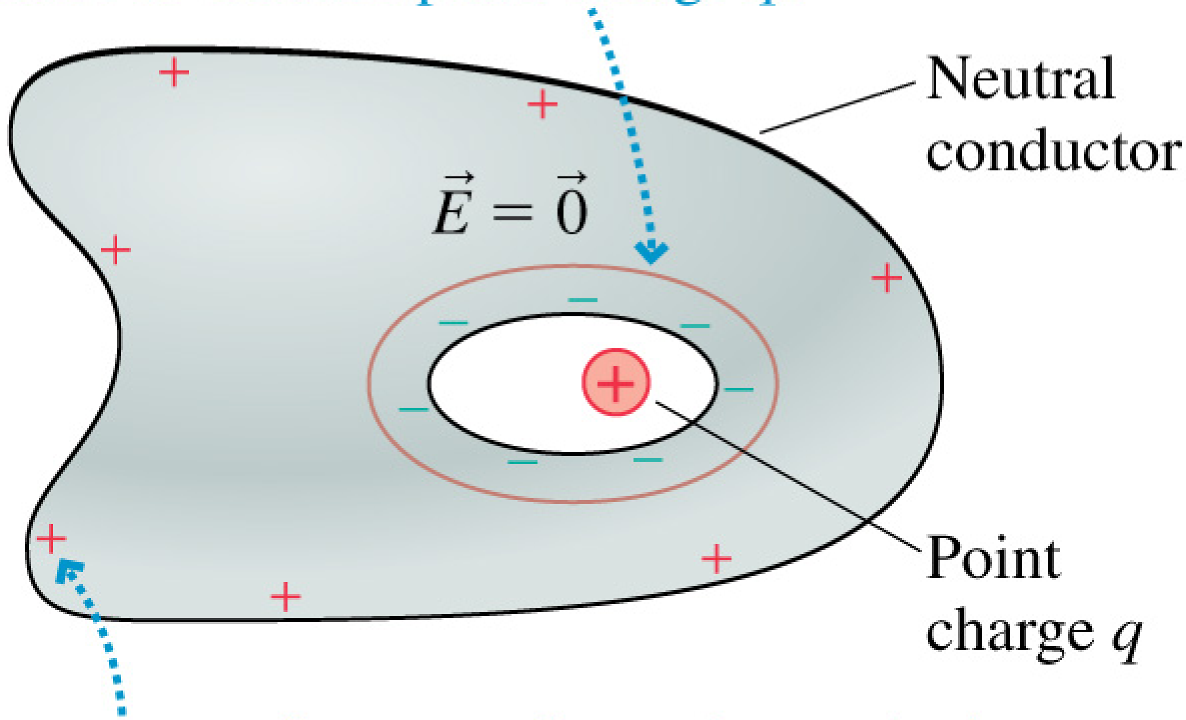
Conductor with a Cavity



Can there be charge on this interior surface?

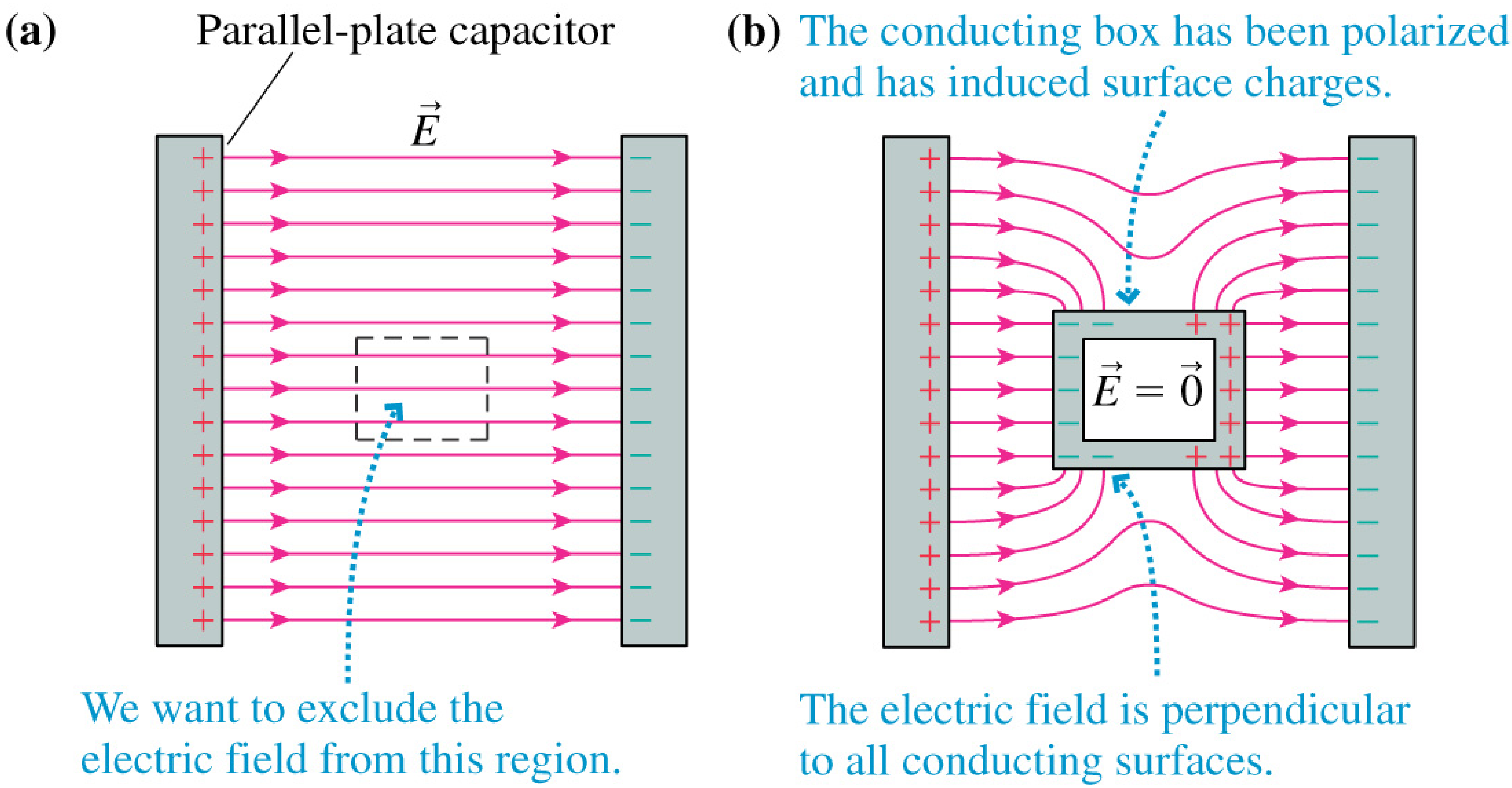
Charge Inside Cavity

The flux through the Gaussian surface is zero, hence there's no *net* charge inside this surface. There must be charge $-q$ on the inside surface to balance point charge q.



The outer surface must have charge $+q$ in order that the conductor remain neutral.

Screening of Electric Field



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Chapter 29 (Electric Potential) begins…

Mechanical Energy, Potential Energy

Energy conservation: Mechanical energy $E_{mech} = K + U$ is conserved for particles that interact via ***conservative forces***

K - kinetic energy: $K=\Sigma K_i$, where $K_i = m_i v_i^2/2$

U - potential energy that is the *interaction* energy of the system

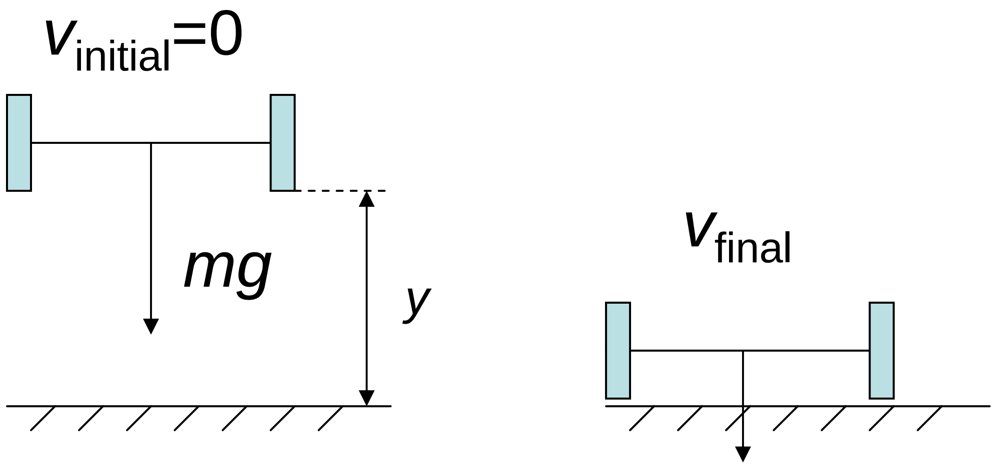
$\Delta U = U_f - U_i = -W$

Example - gravity: $U_{grav} = mgy$

Each U_{grav} is uniquely described by height y

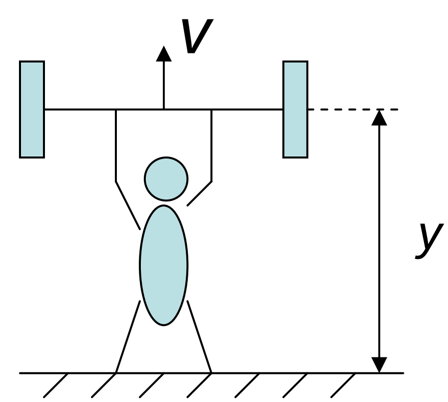
Each y has a unique $U=mgy$, however what happens to the total mechanical energy in these two cases?

Case 1: Gravity



- Is gravity a conservative force?
- Is mechanical energy conserved?
- What happens to mechanical energy on impact?

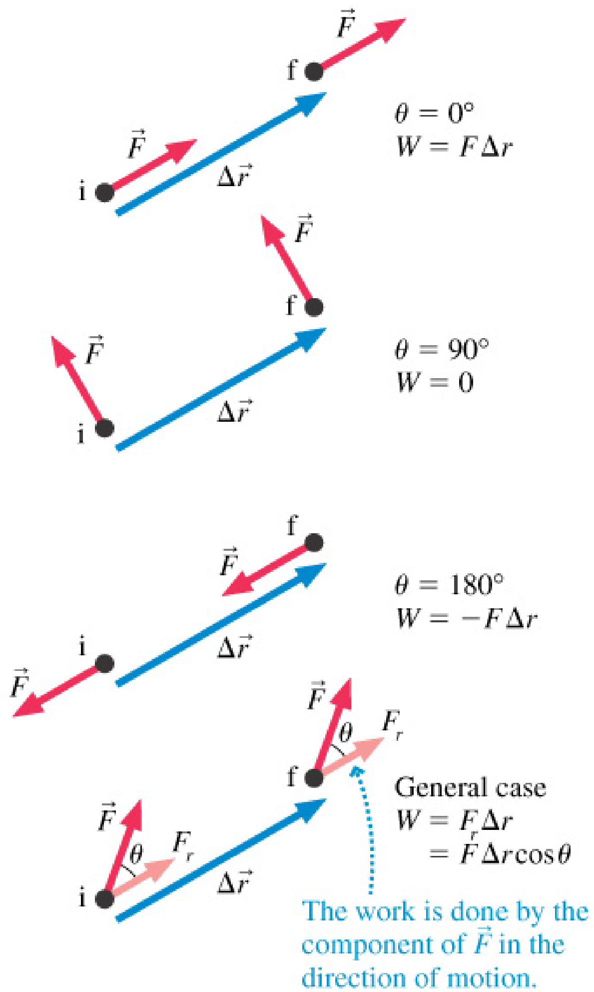
Case 2: Man



- Is the man's force a conservative force?
- Is mechanical energy conserved?
- What happens to mechanical energy as weight lifts?

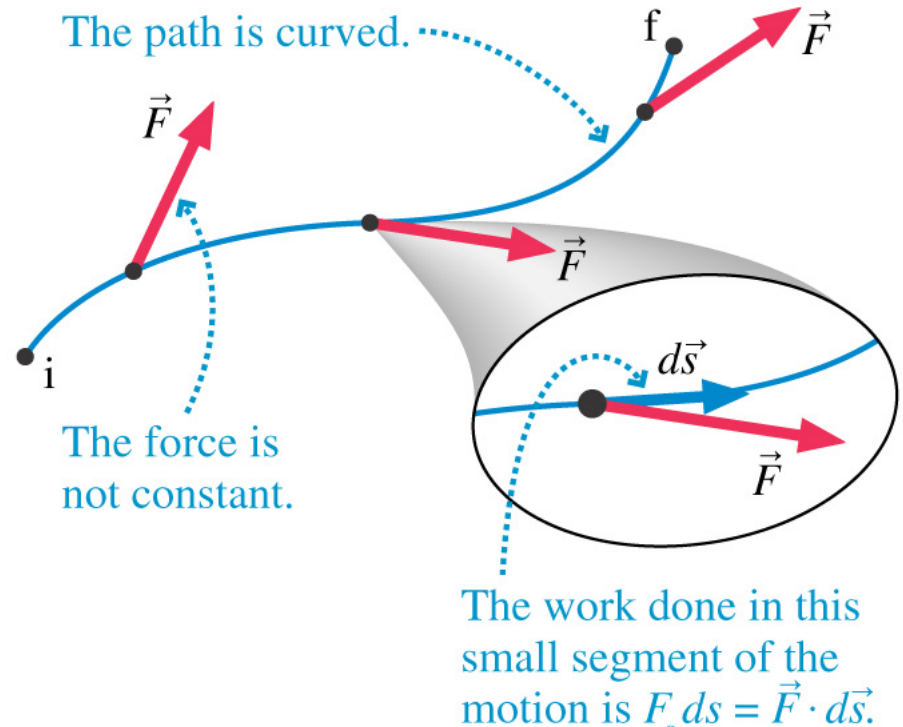
Change of the potential energy: $\Delta U = U_f - U_i = -W$

Constant Force



$W = \boldsymbol{F}\Delta\boldsymbol{r} = \boldsymbol{F}\ \Delta\boldsymbol{r}\cos\theta$

Not Constant Force



$$W = \sum_j (F_s)_j \Delta s_j \rightarrow \int_{s_i}^{s_f} F_s ds = \int_i^f \mathbf{F} d\mathbf{s}$$

End of Lecture 7
Reading: Chapter 29
Home Work 3