February 17, 2016

Simple Harmonic Motion

- Simple → most basic model
- Harmonic → back and forth (Oscillatory)

Aside on Potential Energy

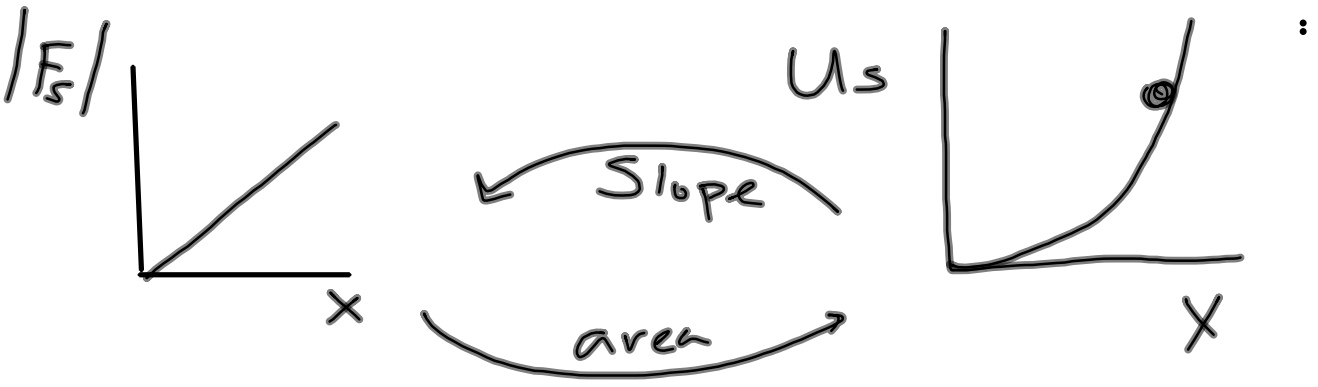
Hooke's Law

$F_{spring} = k X$ ~ distance from equilibrium

spring constant

$F_{spring} = -kx$

$U_s = \frac{1}{2} k x^2$

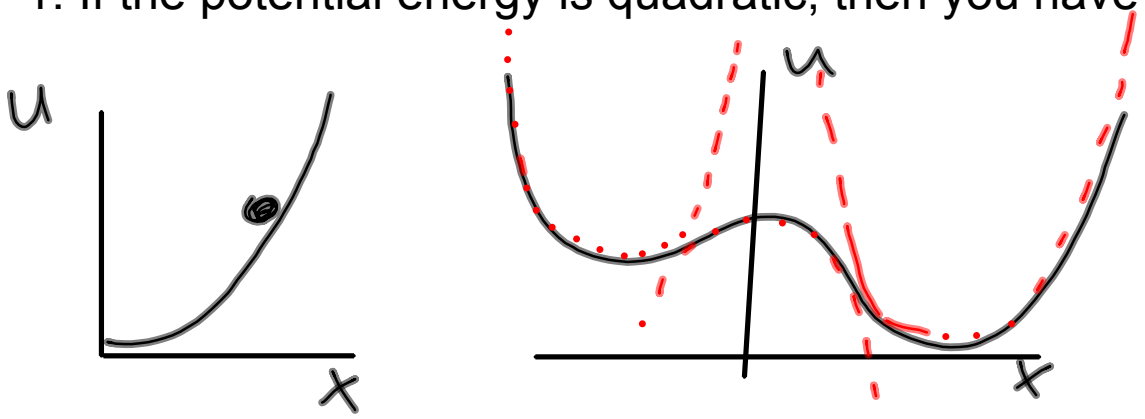


We used the area under the curve of the F vs x graph to get the potential energy. We can assume that the slope of a potential graph would give us the force.

The slope of the spring potential is always positive when X > 0 --> F spring should be negative when x > 0.

Definition of SHM

1. If the potential energy is quadratic, then you have SHM.



2. Differential Equation: An equation that relates the slope of a quantity to that quantities value.

$F_{spring} = -kx$ $F_{net} = ma$

$ma = -kx$

$a = -\frac{k}{m}x$

$x'' = -\frac{k}{m}x$

$a = -\omega^2 x$ (omega)

for springs $\omega^2 = \frac{k}{m}$

3. If there is a linear restoring force, then you have simple harmonic motion.