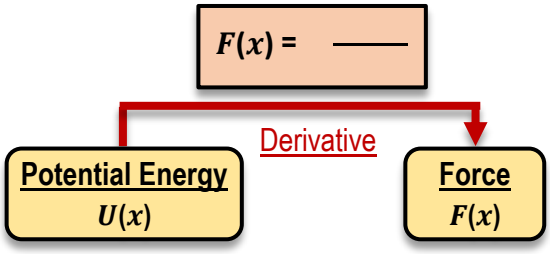
Calculating Forces from Potential Energy Functions

◆ When given potential energy FUNCTIONS $\boldsymbol{U(x)}$ and asked for Force $\boldsymbol{F(x)}$, take the _____.



	Potential Energy	Force
Spring	$U_{el} = \frac{1}{2} kx^2$	
Gravity	$U_g = mgy$	

EXAMPLE

A particle moves according to the function $U(x) = -2x^2 + 0.3x^3$. When it reaches $x = 4$m, calculate the magnitude and direction of the force on it.

PRACTICE

A particle moves along the x-axis. The potential energy function is given by $U(x) = e^{-x^2}$. What is the force acting on this particle?

EXAMPLE

For a pair of atoms separated by a distance x, the potential energy function is given by $U(x) = -\frac{A}{x^6}$, where A is a positive constant. What is the force one atom exerts on the other? Is this force attractive or repulsive?