General approach to many areas of physics:
1) Find a DEQ that describes the situation
2) Find the "solution" (the function that causes the DEQ to hold true), by power series, guessing, or other method.

For mechanical systems, can get the DEQ from $F=ma$:

For a system near equilibrium, $F=-kx$, so:

$F=-kx \Rightarrow -kx=ma \Rightarrow F=ma$
or $-kx=m\ddot{x}$  Each dot indicates a time derivative

$\Rightarrow \dot{x} = \frac{-k}{m} x$

guess solution:

$x = A \cos(\omega t + \phi) \\
\Rightarrow \dot{x} = -A\omega_0 \sin(\omega t + \phi)$

$\Rightarrow \ddot{x} = -A\omega_0^2 \cos(\omega t + \phi)$

$= -\frac{k}{m} x$ if $\omega_0 = \sqrt{\frac{k}{m}}$

$A$ & $\phi$ are determined by $x_0$ & $\dot{x}_0$.

Inductors

$L = \frac{\Phi_B}{I}$

$\Rightarrow V_L = L \frac{\dot{I}}{I}$