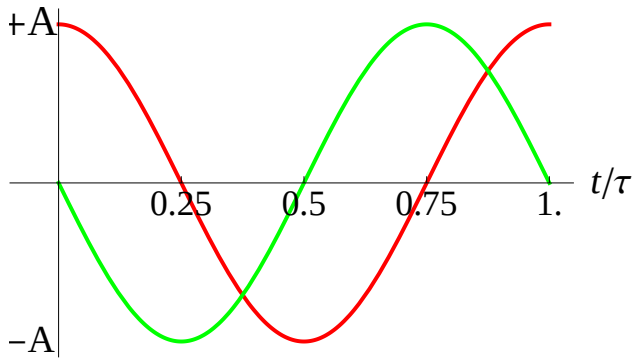
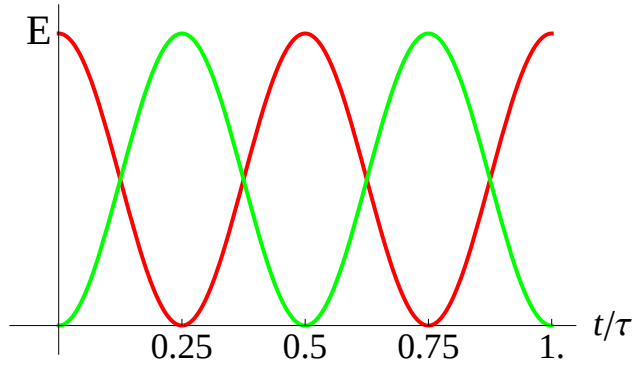
Mechanical vs Electromagnetic Oscillations

mechanical oscillations

- position: $x(t) = A\cos(\omega t)$ [red]
- velocity: $v(t) = -A\sin(\omega t)$ [green]
- period: $\tau = \dfrac{2\pi}{\omega}, \quad \omega = \sqrt{\dfrac{k}{m}}$



- potential energy: $U(t) = \dfrac{1}{2}kx^2(t)$ [r]
- kinetic energy: $K(t) = \dfrac{1}{2}mv^2(t)$ [g]
- total energy: $E = U(t) + K(t) = \text{const}$



electromagnetic oscillations

- charge: $Q(t) = A\cos(\omega t)$ [red]
- current: $I(t) = -A\sin(\omega t)$ [green]
- period: $\tau = \dfrac{2\pi}{\omega}, \quad \omega = \dfrac{1}{\sqrt{LC}}$

- electric energy: $U_E(t) = \dfrac{1}{2C}Q^2(t)$ [r]
- magnetic energy: $U_B(t) = \dfrac{1}{2}LI^2(t)$ [g]
- total energy: $E = U_E(t) + U_B(t) = \text{const}$