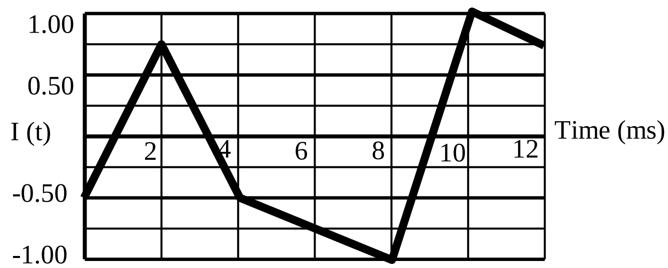
Physics 2120 Quiz #5 Name ____________________________



The plot above is of current flowing through a 75.0 mH inductor.

a) What is the average emf (voltage) between 0 and 12 ms?

For average emf, we can find the difference in current over difference in time from the plot.

$$\varepsilon = -L\frac{\Delta I}{\Delta t} = -L\frac{\left(I_f - I_0\right)}{\left(t_f - t_0\right)}$$

$$\varepsilon = -(75\times10^{-3}H)\frac{\left(0.75A-(-0.50A)\right)}{\left(12\times10^{-3}s-0s\right)} = -(75\times10^{-3}H)\frac{\left(1.25A\right)}{\left(12\times10^{-3}s\right)}$$

$$\varepsilon = -7.81\ V$$

b) What is the instantaneous emf (voltage) at 6 ms?

For instantaneous emf, we need to find the slope at 6 ms. Since the current follows a straight line between 4 and 8 ms, we can find the slope by taking the difference in current between these two times.

$$\varepsilon = -L\frac{dI}{dt} = -L\frac{\Delta I}{\Delta t} = -L\frac{\left(I_f - I_0\right)}{\left(t_f - t_0\right)}$$

$$\varepsilon = -(75\times10^{-3}H)\frac{\left(-1.00A-(-0.50A)\right)}{\left(8.0\times10^{-3}s-4.0\times10^{-3}s\right)} = -(75\times10^{-3}H)\frac{\left(-0.50A\right)}{\left(4.0\times10^{-3}s\right)}$$

$$\varepsilon = 9.38\ V$$