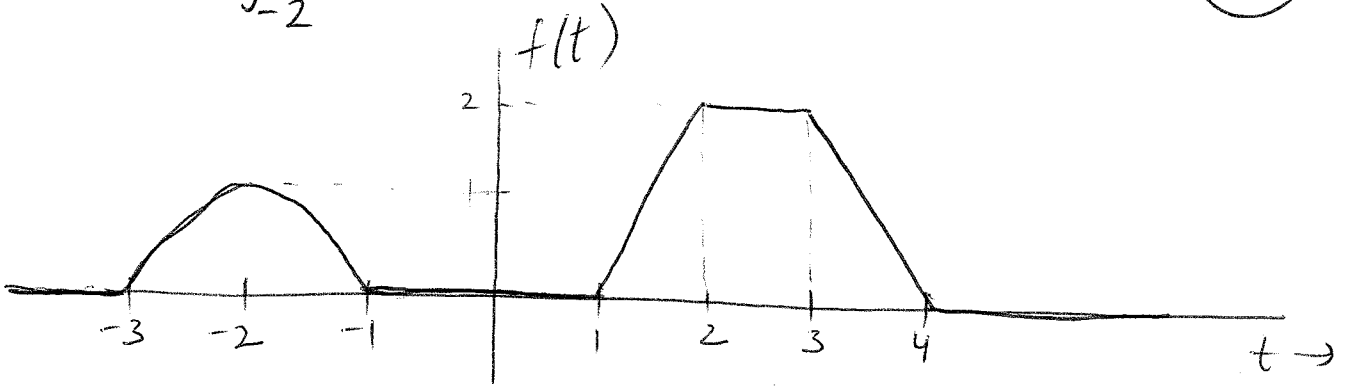
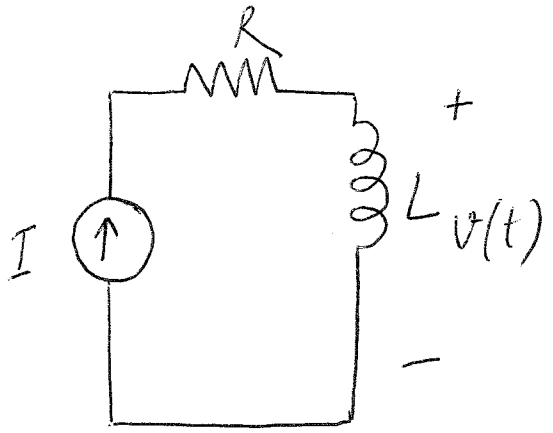
Duration: 50 minutes EEL 3123C - Mid-term I Fall 2007

1. For the figure below, compute (a) $\int_{-5}^{5} f(t)\delta(t+2)\,dt$ and (b) $\int_{-2}^{2} f(t)\delta(t-3)\,dt$. (20)



2. Given $a \geq 0$ and $u(t)$ being the unit step function, find the Laplace transform of (a) $f(t) = (t-a)^2 u(t)$ and (b) $f(t) = (t-a)^2 u(t-a)$. (30)

3.



$R = 100\,\Omega$

$L = 5\,mH$

$I = 100\sin(100t)$

Find $v_{s-s}(t)$. (50)

Fall 2007 EEL 3123C - Solutions (Mid term 1)

1. (a) $\int_{-5}^{5} f(t)\,\delta(t+2)\,dt = f(-2) = 1.$ (10)

(b) $\int_{-2}^{2} f(t)\,\delta(t-3)\,dt = 0.$ (10)

2. (a) $F(s) = \int_{0}^{\infty} (t-a)^2 e^{-st}\,dt$

$= \int_{0}^{\infty} (t^2 + a^2 - 2at)\,e^{-st}\,dt = \frac{2}{s^3} + \frac{a^2}{s} - \frac{2a}{s^2}$ (15)

(b) $F(s) = e^{-as}\,\mathcal{L}\{t^2\} = e^{-as}\,\frac{2}{s^3}$ (15)

3. ~~$H(s) = \frac{sL}{R+s}$~~

3. $H(s) = sL \Rightarrow H(j\omega) = j\omega L$ (10)

$|H(j\omega)| = \omega L$ (10), $\theta(j\omega) = 90^\circ$ (10)

$v_{s-s}(t) = 100 \cdot 5e{-3} \cdot 100 \sin(100t + 90^\circ)$

$= 50 \sin(100t + 90^\circ)$ (20)