

# Engineering Mathematics

Quiz 4, Fall 2014/12/22

請詳細列出計算過程，如用到公式，請列出公式的通式。請記得在答案卷上簽名。

1. Find:  $\mathcal{L}^{-1}\left\{\frac{(1+e^{-2s})^2}{s+2}\right\}$

Sol:

$$e^{-2t} + 2e^{-2(t-2)}H(t-2) + e^{-2(t-4)}H(t-4)$$

2. Use the Laplace transform to solve the following differential problems

$$y'' + 4y' + 3y = 3\delta(t-2) + H(t-1), y(0) = y'(0) = 0$$

Sol:

$$y(t) = \left[ \frac{3}{2}e^{-(t-2)} - \frac{3}{2}e^{-3(t-2)} \right] H(t-2) + \left[ \frac{1}{3} - \frac{1}{2}e^{-(t-1)} + \frac{1}{6}e^{-3(t-1)} \right] H(t-1)$$

3.  $y' + 2y = 0$  find the Taylor series solution at  $x = 0$

Sol:

$$y(x) = \sum_{n=0}^{\infty} a_n x^n = \sum_{n=0}^{\infty} \frac{(-2)^n}{n!} a_0 x^n = a_0 e^{-2x}$$

4.  $f(t) = t^2 + 3t + 2$ , Find:  $\mathcal{L}\{f(t)H(t-2)\}$

Sol:

$$\frac{2}{s^3}e^{-2s} + \frac{7}{s^2}e^{-2s} + \frac{12}{s}e^{-2s}$$

5. Find:  $\mathcal{L}^{-1}\left\{\frac{-2s+6}{s^2+4}\right\}$

Sol:

$$-2\cos 2t + 3\sin 2t$$