

**Homework #8**

Math 527, UNH fall 2011

Due Friday, Oct. 21 in lecture.

**Problems 1–6:** Find the inverse Laplace transforms

(1)  $\mathcal{L}^{-1} \left\{ \frac{3}{s} + \frac{4}{s^5} - \frac{1}{s+7} \right\}$

(2)  $\mathcal{L}^{-1} \left\{ \frac{s}{(s+2)(s^2+4)} \right\}$

(3)  $\mathcal{L}^{-1} \left\{ \frac{s}{s^2+2s+5} \right\}$

(4)  $\mathcal{L}^{-1} \left\{ \frac{2s+5}{(s+2)(s^2+4)} \right\}$

(5)  $\mathcal{L}^{-1} \left\{ \frac{1}{s+3} e^{-5s} \right\}$

(6)  $\mathcal{L}^{-1} \left\{ \frac{1}{s^2+5} e^{-3s} \right\}$

**Problems 7,8:** Express the function  $f(t)$  in terms of the Heaviside function  $\mathcal{U}$  and then find the Laplace transform  $\mathcal{L}\{f\}$ .

(7)  $f(t) = \begin{cases} 2 & 0 \leq t < 3 \\ -2 & 3 \leq t \end{cases}$

(8)  $f(t) = \begin{cases} 0 & 0 \leq t < 3\pi/2 \\ \sin t & 3\pi/2 \leq t \end{cases}$

**Problems 10–12:** Use Laplace transforms to find the solutions of the initial-value problems.

(10)  $y'' - 4y' + 4y = t^3, \quad y(0) = 1, \quad y'(0) = 0$

(11)  $y'' - 4y' + 4y = t^3 e^{2t}, \quad y(0) = 0, \quad y'(0) = 0$

(12)  $y'' + 4y = f(t), \quad y(0) = 0, \quad y'(0) = -1, \quad \text{where } f(t) = \begin{cases} 1 & 0 \leq t < 1 \\ 0 & 1 \leq t \end{cases}$