

MATH 2070 HOMEWORK 9

(1) Use the first translation theorem to find the following Laplace transforms

- (a) $\mathcal{L}\{(t + t^{10})e^{-6t}\}.$
- (b) $\mathcal{L}\{(t - 1)^2e^{-2t}\}.$
- (c) $\mathcal{L}\{(1 - e^{-2t})^2 \cos 5t\}.$

(2) Use the second translation theorem to find the following Laplace transforms.

- (a) $\mathcal{L}\{e^{2-t}\mathcal{U}(t - 2)\}.$
- (b) $\mathcal{L}\{(3t + 1)\mathcal{U}(t - 1)\}.$
- (c) $\mathcal{L}\{\sin t\mathcal{U}(t - \pi/2)\}.$

(3) Use the second translation theorem to find the following inverse Laplace transforms.

- (a) $\mathcal{L}^{-1}\left\{\frac{(1 + e^{-2s})^2}{s + 2}\right\}.$
- (b) $\mathcal{L}^{-1}\left\{\frac{se^{-\pi s/2}}{s^2 + 4}\right\}.$
- (c) $\mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s^2(s - 1)}\right\}.$

(4) Use Laplace transform to solve the following IVPs

- (a) $\frac{dy}{dt} + 2y = f(t), y(0) = 0, f(t) = \begin{cases} t & 0 \leq t < 1 \\ 0 & t \geq 1 \end{cases}$
- (b) $y'' + 2y = f(t), y(0) = 0, y'(0) = 0, f(t) = \begin{cases} 0 & 0 \leq t < \pi \\ 1 & \pi \leq t < 2\pi \\ 0 & t \geq 2\pi \end{cases}$