

## Laplace Transforms

1. Compute the Laplace Transforms of the following functions:

- a)  $x(t) = 4 \sin(100t)u(t)$
- b)  $x(t) = 4 \sin(100t - 10)u(t - 0.1)$
- c)  $x(t) = 2u(t) + \delta(t - 4) - \cos(5t)u(t)$
- d)  $x(t) = tu(t) - 2(t - 2)u(t - 2) + (t - 3)u(t - 3)$
- e)  $x(t) = u(t) - e^{-2t} \cos(10t) u(t)$

2. Compute the inverse Laplace Transforms of the following functions:

- a)  $X(s) = \frac{10(s+1)}{s^2 + 4s + 3}$
- b)  $X(s) = \frac{10(s+1)}{s^2 + 4s + 8}$
- c)  $X(s) = \frac{2s+100}{(s+1)(s+8)(s+10)}$
- d)  $X(s) = \frac{10(s+1)}{s^2 + 4s + 3} e^{-2s}$
- e)  $X(s) = \frac{20}{s(s^2 + 10s + 16)}$
- f)  $X(s) = \frac{10(s+1)}{(s^2 + 4s + 8)s}$

3. Find the limit as  $t \rightarrow \infty$  of  $x(t)$  (if the limit exists)

- a)  $X(s) = \frac{10(s+1)}{s(s^2 + 4s + 3)}$
- b)  $X(s) = \frac{10(s+1)}{s(s^2 + 4s + 8)}$
- c)  $X(s) = \frac{10(s+1)}{s(s^2 + 2s - 3)}$

4. Give the general form of  $x(t)$  (do not solve for the coefficients explicitly).

- a)  $X(s) = \frac{2s+100}{(s+2)(s+6)(s+10)}$
- b)  $X(s) = \frac{2s+100}{s(s+1)(s+8)(s-4)}$
- c)  $X(s) = \frac{s-40}{(s+1)(s+8)(s+10)}$
- d)  $X(s) = \frac{10(s+1)}{s(s^2 + 4s + 3)}$
- e)  $X(s) = \frac{10(s+1)}{s(s^2 + 4s + 8)}$
- f)  $X(s) = \frac{s+1}{s(s^2 + 4)(s+8)}$
- g)  $X(s) = \frac{20(s+1)}{(s^2 + 16)((s+4)^2 + 25)(s+1)}$