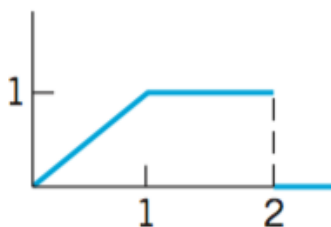


LAPLACE TRANSFORM REVIEW PROBLEMS

1. Find the Laplace transform for the following functions. If an image is given, first write out the function and then take the transform.

- a) $e^{-t} \sinh(4t)$
- b) $1.5 \sin(3t - \pi/2)$
- c) Function given in the following figure:



2. Solve the following initial value problems:

- a) $y'' + 9y = 10e^{-t}$, $y(0) = y'(0) = 0$
- b) $y'' + 0.04y = 0.02t^2$, $y(0) = -25$, $y'(0) = 0$

3. Find the inverse Laplace transform:

- a) $Y(s) = \frac{2(e^{-s} - e^{-3s})}{s^2 - 4}$
- b) $Y(s) = \frac{1 + e^{2\pi(s+1)}(s+1)}{(s+1)^2 + 1}$

4. Solve the initial value problem:

$$y'' + 9y = f(t), \quad y(0) = 0, \quad y'(0) = 4$$

where $f(t) = 8 \sin(t)$ for $0 < t < \pi$ and 0 for $t > \pi$.

5. Solve the initial value problem:

$$y'' + 4y' + 5y = \delta(t - 1), \quad y(0) = 0, \quad y'(0) = 3$$

6. a) Find the Laplace transform: $f(t) = \frac{1}{2}te^{-3t}$

- b) Find the inverse Laplace transform: $F(s) = \cot^{-1}\left(\frac{s}{\pi}\right)$. Hint: $\frac{d}{dx}(\cot^{-1}(x)) = \frac{-1}{1+x^2}$.

7. Solve $y'' + 4y = f(t)$, $y(0) = y'(0) = 0$ with $f(t)$ defined by the following figure:

