1. Use Laplace transforms to solve this initial value problem:

\[ y'' + 2y' + y = 4 \quad y(0) = 2 \quad y'(0) = 0 \]

2. Use Laplace transforms to find \( x(t) \) and \( y(t) \):

\[
\begin{align*}
x'' - 4y &= 1 & x(0) = 0 & x'(0) = 0 \\
y'' - 4x &= 1 & y(0) = 0 & y'(0) = 0
\end{align*}
\]

3 - 5. Find the Laplace transform of each of these functions:

3. \( f(t) = e^{-3t} \cos 2t \)

4. \[
f(t) = \begin{cases} 
0 & 0 < t < 3 \\
(t - 3)^2 e^{3-t} & 3 < t
\end{cases}
\]

5. \[
f(t) = \begin{cases} 
0 & 0 < t < 1 \\
t^2 & t > 1
\end{cases}
\]

6. Find the function which is continuous on \([0, \infty)\) and has this function as its Laplace transform:

\[
\frac{1}{s(s^2 + 4)}
\]

a) Use convolutions

b) Use a partial fraction decomposition

7. Find the function which is continuous on \([0, \infty)\) and has this function as its Laplace transform:

\[
\frac{e^{-s}}{s(s + 2)}
\]