6. (14 pts) Write the following function in terms of unit step functions, and find its Laplace transform.

\[ g(t) = \begin{cases} 
  t^2 + 1 & 0 \leq t < 1 \\
 e^{-3t} + 1 & 1 \leq t < 2 \\
 1 & t \geq 2 
\end{cases} \]
8. (12 pts) Find the inverse Laplace transform of:

\[ F(s) = \frac{s^2 - 4}{s^3 + 6s^2 + 9s} \]
9. (20 pts) Solve the following initial value problem:

\[ y'' + 4y' + 8y = e^{2t} - 2\delta(t - 2\pi), \quad y(0) = 2, \quad y'(0) = 0 \]