Signals and Systems problem for the Fall 2012 MS Exam in ECE

Suppose a causal, linear, time-invariant system with input \( x(t) \) and output \( y(t) \) is described by the differential equation

\[
\frac{d^2y}{dt^2} - \frac{dx}{dt} + 5 \frac{dy}{dt} = x - 6y
\]

Find the output \( y(t) \) when the input is \( x(t) = 2\delta(t - 1) - 4e^{-4t+4}u(t - 1) \), where \( \delta \) is the Dirac delta function and \( u \) is the unit step function.