Assignment # 3.

(1) Given the relationships.

$$y(t) = x(t) * h(t)$$

and $$g(t) = x(3t) * h(3t)$$

and given that $x(t)$ has fourier transform, $X(w)$ and $h(t)$ has fourier transform $H(w)$, use fourier transform properties to show that $g(t)$ has the form $g(t) = Ay(Bt)$. Determine the values of A and B.

(2) Consider a causal LTI system with frequency response $H(w) = \frac{1}{3+jw}$

for a particular input $x(t)$ this system ~~with frequency~~ is observed to produce the output

$$y(t) = e^{-3t}u(t) - e^{-4t}u(t).$$

Determine $x(t)$.

Assignment #4.

Compute and analyse the fourier transformation of each of the following signals:

(i) $x[n] = u[n-2] - u[n-6]$.

(ii) $x[n] = \left(\frac{1}{2}\right)^n u[-n-1]$.

(iii) $x[n] = \left(\frac{1}{3}\right)^{|n|} u[-n-2]$.

(iv) $x[n] = 2^n \sin\left(\frac{\pi}{4} n\right) u[-n]$.

(v) $x[n] = \left(\frac{1}{2}\right)^{|n|} \cos\left\{\frac{\pi}{8}(n-1)\right\}$.

(vi) $x[n] = \begin{cases} n & -3 \le n \le 3 \\ 0, & \text{otherwise.} \end{cases}$

(vii) $x[n] = \sin\left(\frac{\pi}{2} n\right) + \cos n$

(viii) $x[n] = \sin\left(\frac{5\pi}{3} n\right) + \cos\left(\frac{7\pi}{3} n\right)$

(ix) $x[n] = x(n-6)$, and $x[n] = u[n] - u[n-5]$ For $0 \le n \le 5$.

(x) $x[n] = (n-1)\left(\frac{1}{3}\right)^{|n|}$

(xi) $x[n] = \frac{\sin(\pi n/5)}{\pi n} \cos\left(\frac{7\pi}{2} n\right)$.