Solution of ECE 315 Test 4 F07

1. If $y(t) = \text{tri}(t/3) * 2\delta(t+1)$, find the numerical value of $y(-2)$. $y(-2) =$ _____

$$y(t) = \text{tri}(t/3) * 2\delta(t+1) = 2\,\text{tri}((t+1)/3) \Rightarrow y(-2) = 2\,\text{tri}((-2+1)/3) = 2\,\text{tri}(-1/3) = 4/3$$

2. A continuous-time system is described by $2y'(t) + 4y(t) = -x(t)$, where x is the excitation and y is the response. If $x(t) = Xe^{j\omega t}$ and $y(t) = Ye^{j\omega t}$ and $H(j\omega) = \frac{Y}{X}$ find the numerical value of $H(j2)$.
$H(j2) =$ _____

$$H(s) = \frac{-1}{2s+4} \Rightarrow H(j\omega) = -\frac{1}{j2\omega + 4} \Rightarrow H(j2) = -\frac{1}{j4+4} = -0.125 + j0.125 = 0.1768e^{j2.3562}$$

3. If $y(t) = x(t) * h(t) = (1 - e^{-2t})u(t)$ and $w(t) = x(t) * h'(t)$ find the numerical value of $w(1)$.
$w(1) =$ _____

$$w(t) = y'(t) = \underbrace{(1 - e^{-2t})}_{=0 \text{ at } t=0}\delta(t) + 2e^{-2t}u(t) = 2e^{-2t}u(t) \Rightarrow w(1) = 2e^{-2} = 0.2707$$

Solution of ECE 315 Test 4 F07

1. If $y(t) = \text{tri}(t/4) * 3\delta(t+1)$, find the numerical value of $y(-2)$. $y(-2) =$ _____

$$y(t) = \text{tri}(t/4) * 3\delta(t+1) = 3\text{tri}((t+1)/4) \Rightarrow y(-2) = 3\text{tri}((-2+1)/4) = 3\text{tri}(-1/4) = 9/4$$

2. A continuous-time system is described by $4y'(t) + 2y(t) = -x(t)$, where x is the excitation and y is the response. If $x(t) = Xe^{j\omega t}$ and $y(t) = Ye^{j\omega t}$ and $H(j\omega) = \frac{Y}{X}$ find the numerical value of $H(j2)$.
$H(j2) =$ _____

$$H(s) = \frac{-1}{4s+2} \Rightarrow H(j\omega) = -\frac{1}{j4\omega+2} \Rightarrow H(j2) = -\frac{1}{j8+2} = -0.0294 + j0.1176 = 0.1213e^{j1.8158}$$

3. If $y(t) = x(t) * h(t) = (1-e^{-3t})u(t)$ and $w(t) = x(t) * h'(t)$ find the numerical value of $w(1)$.
$w(1) =$ _____

$$w(t) = y'(t) = \underbrace{(1-e^{-3t})}_{=0 \text{ at } t=0}\delta(t) + 3e^{-3t}u(t) = 3e^{-3t}u(t) \Rightarrow w(1) = 3e^{-3} = 0.1494$$

Solution of ECE 315 Test 4 F07

1. If $y(t) = \text{tri}(t/3) * 2\delta(t+4)$, find the numerical value of $y(-2)$. $y(-2) =$ _____

$$y(t) = \text{tri}(t/3) * 2\delta(t+4) = 2\,\text{tri}((t+4)/3) \Rightarrow y(-2) = 2\,\text{tri}((-2+4)/3) = 2\,\text{tri}(2/3) = 2/3$$

2. A continuous-time system is described by $2y'(t) + 3y(t) = -x(t)$, where x is the excitation and y is the response. If $x(t) = Xe^{j\omega t}$ and $y(t) = Ye^{j\omega t}$ and $H(j\omega) = \frac{Y}{X}$ find the numerical value of $H(j2)$.
$H(j2) =$ _____

$$H(s) = \frac{-1}{2s+3} \Rightarrow H(j\omega) = -\frac{1}{j2\omega+3} \Rightarrow H(j2) = -\frac{1}{j4+3} = -0.120 + j0.160 = 0.2e^{j2.2143}$$

3. If $y(t) = x(t) * h(t) = (1 - e^{-t/2})u(t)$ and $w(t) = x(t) * h'(t)$ find the numerical value of $w(1)$.
$w(1) =$ _____

$$w(t) = y'(t) = \underbrace{(1 - e^{-t/2})}_{=0 \text{ at } t=0}\delta(t) + (1/2)e^{-t/2}u(t) = (1/2)e^{-t/2}u(t) \Rightarrow w(1) = (1/2)e^{-1/2} = 0.3033$$