

Chrys Sean T. Servillo Group 3

21/01/819

Question 1

$$x(t) = \begin{cases} 0, & t < 0 \\ 3t, & 0 \leq t < 1 \\ -3t+6, & 1 \leq t < 2 \\ 0, & 2 \leq t < 3 \\ -1, & 3 \leq t < 4 \\ 0, & t \geq 4 \end{cases}$$

$$s = 2t + 1 \quad y(t) = x(s)$$

$$t = \frac{s-1}{2}$$

$$\begin{aligned} t &= \frac{0-1}{2} & t &= \frac{1-1}{2} & t &= \frac{2-1}{2} & t &= \frac{3-1}{2} \\ t &= -\frac{1}{2} & t &= 0 & t &= \frac{1}{2} & t &= 1 \end{aligned}$$

Question 2

$$t = \frac{4-1}{2}$$

$$y(t) = \begin{cases} 0, & t < -\frac{1}{2} \\ 6t+3, & -\frac{1}{2} \leq t < 0 \\ -6t+3, & 0 \leq t < \frac{1}{2} \\ 0, & \frac{1}{2} \leq t < 1 \\ -1, & 1 \leq t < \frac{3}{2} \\ 0, & t \geq \frac{3}{2} \end{cases}$$

$$y - y_2 = \frac{y_2 - y_1}{x_2 - x_1} (x - x_2)$$

$$y - 3 = \frac{3 - 0}{1 - 0} (x - 1)$$

$$\begin{aligned} y &= 3x - 3 + 3 \\ y &= 3x \\ y &= 3t \end{aligned}$$

$$y - 0 = \frac{0 - 3}{2 - 1} (x - 2)$$

$$y = \frac{-3}{1} (x - 2)$$

$$y = -3x + 6$$

$$y = -3t + 6$$

$$y + 1 = \frac{-1 - 0}{3 - 3} (x + 1)$$

$$y + 1 = 0$$

$$y = -1$$

Question 3. $(a+b)[u(t-t_1) - u(t-t_2)]$

$$6t+3[u(t-\frac{1}{2}) - u(t)] + (-6t+3)[u(t) - u(t-0.5)] - [u(t-1) - u(t-1.5)]$$

$$6t+3[u(t+3) - u(t)] + (-6t+3)[u(t) - u(t-0.5)] - [u(t-1) - u(t-1.5)]$$

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Groups

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Question 4

$$y(t) = \int_{\infty}^t x(\tau) d\tau$$

$$x(\tau) = 0 \int_{\infty}^0 0 d\tau = 0$$

$$x(\tau) = 3\tau \int_0^+ 3\tau d\tau = \frac{3}{2}\tau^2 + C$$
$$x(\tau) = -3\tau + 6 \quad r(1) = \frac{3}{2}\tau^2 + 6$$
$$\int_1^+ -3\tau + 6 d\tau = -\frac{3}{2}\tau^2 + 6\tau + C = -4.5$$

~~partial integration~~

$$r(t) = \frac{3}{2}t^2 + \left(\frac{3}{2}\tau^2 + 6\tau - 4.5\right) = -\frac{3}{2}t^2 + 6t - 3$$

$$r(2) = 3$$

$$x(\tau) = 0 \int_2^+ x(\tau) d\tau = 0$$

$$r(t) = 0 + 3 = 3$$

$$r(3) = 3$$

$$r(t) = 3$$

$$x(\tau) \checkmark \quad X(\tau) = -1 \quad \int_3^+ (-1) d\tau = -1 - 3 = -(t - 3)$$

$$r(t) = r(3) + t(-3)$$

$$r(t) = 3 - (t - 3)$$

$$r(t) = 6 - t$$

$$r(4) = 6 - 4 = 2$$

$$x(\tau) = 0 \int_4^+ 0 d\tau = 0$$

$$r(t) = r(4) + 0$$

$$r(t) = 2$$

$$r(t) = \begin{cases} 0, & t \leq 0 \\ \frac{3}{2}t^2, & 0 \leq t \leq 1 \\ -\frac{3}{2}t^2 + 6t - 3, & 1 \leq t \leq 2 \\ 3, & 2 \leq t \leq 3 \\ 6 - t, & 3 \leq t \leq 4 \\ 2, & t \geq 4 \end{cases}$$