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21001819

Question 1

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

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

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

$$t = \frac{0-1}{2} \quad t = \frac{1-1}{2} \quad t = \frac{2-1}{2} \quad t = \frac{3-1}{2}$$

$$t = -\frac{1}{2} \quad t = 0 \quad t = \frac{1}{2} \quad t = 1$$

Question 2

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

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

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

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

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

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

$$y = 3x - 3 + 3$$

$$y = 3x$$

$$y = 3t$$

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

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

$$y = -3x + 6$$

$$y = -3t + 6$$

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

$$y + 1 = 0$$

$$y = -1$$

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Question 4

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

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

$$x(\tau) = 3\tau \int_0^t 3\tau d\tau = \frac{3}{2}t^2$$

$$\left[-\frac{3}{2}\tau^2 + 6\tau\right]_1^t = -\frac{3}{2}t^2 + 6t - \left(-\frac{3}{2} + 6\right)$$

$$x(\tau) = -3\tau + 6 \int_1^t -3\tau + 6 d\tau = -\frac{3}{2}t^2 + 6t - 4.5$$

$$= -\frac{3}{2}t^2 + 6t - 4.5$$

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

$$r(2) = 3$$

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

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

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

$$r(3) = 3$$

$$r(t) = 3$$

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

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

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

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

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

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

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

$$r(t) = 2$$

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