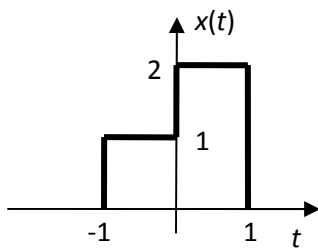


Math Review Questions

- 1) What is the solution to the differential equation $\frac{dy(t)}{dt} = 5x(t)$ with $y(-\infty) = 0$
- 2) What is the solution to the differential equation $\frac{dy(t)}{dt} = 5u(t)$, where $u(t)$ is the unit step function and $y(-\infty) = 0$
- 3) What is the solution to the differential equation $\frac{dy(t)}{dt} = 5y(t)$ with $y(0) = 1$
- 4) What is the solution to the differential equation $\frac{dy(t)}{dt} - 5y(t) = 5$ with $y(0) = 0$
- 5) What is the solution to the differential equation $\frac{dy(t)}{dt} + 5y(t) = 2x(t)$ with initial value $y(t_0)$
- 6) What is the solution to the differential equation $\frac{dy(t)}{dt} + 5ty(t) = 2x(t)$ with initial value $y(t_0)$
- 7) What is the solution to the differential equation $\frac{dy(t)}{dt} + 5y(t) = x(t) + 2$ with initial value $y(t_0)$

Questions 8-11 refer to the function below



- 8) Draw the function $y(t) = x\left(\frac{t}{2}\right)$
- 9) Draw the function $y(t) = x\left(\frac{t}{2} - 1\right)$
- 10) Draw the function $y(t) = -x(-t - 2)$
- 11) Draw the function $y(t) = \frac{1}{2}x(2t - 1)$

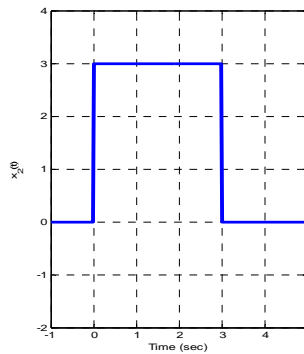
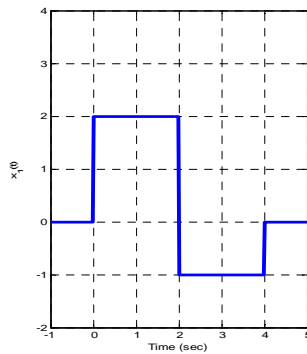
12) If we made the variable substitution $\sigma = \lambda - 1$ in the integral $\int_0^5 x(\lambda - 1)d\lambda$, what is the new integral?

13) If we made the variable substitution $\sigma = 1 - \lambda$ in the integral $\int_{-\infty}^6 x(1 - \lambda)d\lambda$, what is the new integral?

14) If we made the variable substitution $\sigma = \frac{\lambda}{2}$ in the integral $\int_{-\infty}^6 x\left(\frac{\lambda}{2}\right)d\lambda$, what is the new integral?

15) If we made the variable substitution $\sigma = -\frac{\lambda}{2}$ in the integral $\int_{-4}^6 x\left(\frac{-\lambda}{2}\right)d\lambda$, what is the new integral?

Problems 16-20 refer to the functions $x_1(t)$ and $x_2(t)$ shown below:



16) Evaluate the integral $\int_0^5 x_1(\lambda)d\lambda$

17) Evaluate the integral $\int_0^5 [x_1(\lambda)]^2 d\lambda$

18) Sketch $y(t) = x_1(t)x_2(t)$ for $-1 \leq t \leq 5$

19) Evaluate the integral $\int_0^5 x_1(\lambda)x_2(\lambda)d\lambda$

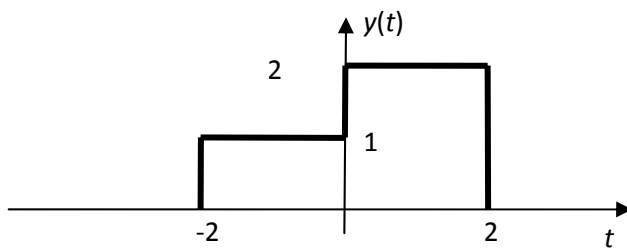
20) Sketch $y(t) = x_1(t) + x_2(t)$ for $-1 \leq t \leq 5$

Answer Key

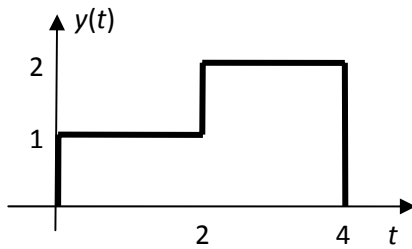
1) $y(t) = 5 \int_{-\infty}^t x(\lambda) d\lambda$ 2) $y(t) = 5r(t)$ 3) $y(t) = e^{5t}$ 4) $y(t) = e^{5t} - 1$

5) $y(t) = e^{-5(t-t_0)} y(t_0) + 2e^{-5t} \int_{t_0}^t e^{5\lambda} x(\lambda) d\lambda$ 6) $y(t) = e^{-\frac{5}{2}(t^2-t_0^2)} y(t_0) + 2e^{-\frac{5}{2}t^2} \int_{t_0}^t e^{\frac{5}{2}\lambda^2} x(\lambda) d\lambda$

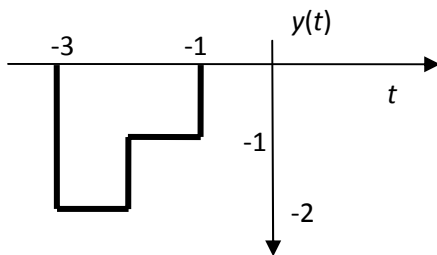
7) $y(t) = \frac{2}{5} + e^{-5(t-t_0)} \left[y(t_0) - \frac{2}{5} \right] + e^{-5t} \int_{t_0}^t e^{5\lambda} x(\lambda) d\lambda$



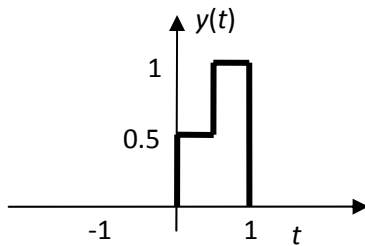
$$y(t) = x\left(\frac{t}{2}\right)$$



$$y(t) = x\left(\frac{t}{2}-1\right)$$



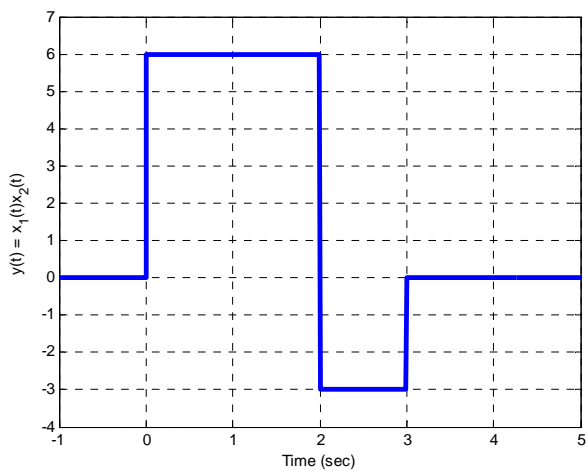
$$y(t) = -x(-t-2)$$



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

12) $\int_{-1}^4 x(\sigma)d\sigma$ 13) $\int_{-5}^{\infty} x(\sigma)d\sigma$ 14) $2\int_{-\infty}^3 x(\sigma)d\sigma$ 15) $2\int_{-3}^2 x(\sigma)d\sigma$ 16) 2 17) 10

18)



19) 9

20)

