1. 请把计算过程和结果写下来，以图片形式提交。

$$\int_{-\infty}^{+\infty}(t+4)\delta(-2t+4)dt = \boxed{3}$$

$$\delta(at) = \frac{1}{|a|}\delta(t)$$

$$x(t)\delta(t-t_0) = x(t_0)\delta(t-t_0)$$

$$\int_{-\infty}^{+\infty}x(t)\delta(t-t_0)dt = \int_{-\infty}^{+\infty}x(t_0)\delta(t-t_0)dt = x(t_0)$$

$$\delta(-2t+4) = \delta(-2(t-2)) = \frac{1}{2}\delta(t-2)$$

$$Answer = \int_{-\infty}^{+\infty}(t+4)\frac{1}{2}\delta(t-2)dt = \frac{1}{2}(t+4)\Big|_{t=2} = 3$$

多选题 1分

设置

2. Which of the following systems are causal?

A $y[n]=x[-n]$

B $y(t)=x(t)\cos(t+1)$

C $y[n]=x[n]x[n-2]$

D $y(t)=x(\sin(t))$

A. $y[-3]=x[3]$

B. $\cos(t+1)$ 这里的t+1与输入无关

D. $\sin(t_0)=\sin(t_0+2\pi)$

$y(t_0)=x(\sin(t_0+2\pi))$

提交

单选题 1分

设置

3. Consider the discrete-time system

$$y[n] = x[n]x[n-2],$$

is this system invertible ?

A Invertible

B Noninvertible

Let $x_1[n] = \delta[n]$

$y[n] = \delta[n] \cdot \delta[n-2] \equiv 0$

Let $x_2[n] = \delta[n-1]$

$y[n] = \delta[n-1] \cdot \delta[n-3] \equiv 0$

There are two different input x_1 and x_2 lead to the same output $y \equiv 0$.

提交

4. Which of the following systems are time-invariant?

- A $y(t) = \sin[x(t)]$
- B $y(t) = \cos t \cdot x(t)$
- C $y(t) = 4x^2(t) + 3x(t)$
- D $y[n] = 2n \cdot x[n]$

B. $x_1(t)$ $\quad y(t) = \cos t \cdot x_1(t)$

$x_2(t) \rightarrow y_2(t) = \cos t \cdot x_2(t)$

Let $x_2(t) = x_1(t-t_0)$,

$y_2(t) = \cos t \cdot x_2(t) = \cos t \cdot x_1(t-t_0)$

$y_1(t-t_0) = \cos(t-t_0) \cdot x_1(t-t_0) \neq y_2(t)$

$\Rightarrow$ The system is time-varying.

A. $x_1(t) \rightarrow y_1(t) = \sin(x_1(t))$

$x_2(t) \rightarrow y_2(t) = \sin(x_2(t))$

Let $x_2(t) = x_1(t-t_0)$

$y_2(t) = \sin(x_2(t)) = \sin(x_1(t-t_0))$

$y_1(t-t_0) = \sin(x_1(t-t_0)) = y_2(t)$

$\Rightarrow$ System A is time-invariant.

5. Which of the following systems are linear?

A $y(t) = tx(t)$

B $y(t) = x^2(t)$

C $y[n] = 2x[n] + 3$

D $y(t) = x(\sin(t))$

A. $x_1(t) \rightarrow y_1(t) = t \cdot x_1(t)$

$x_2(t) \rightarrow y_2(t) = t\, x_2(t)$

$x_3(t) \rightarrow y_3(t) = t\, x_3(t)$

Let $x_3(t) = a x_1(t) + b x_2(t)$.

$y_3(t) = t \cdot x_3(t)$

$= t(a x_1(t) + b x_2(t))$

$= a y_1(t) + b y_2(t) \Rightarrow$ linear

D. $x_1(t) \rightarrow y_1(t) = x_1(\sin t)$

$x_2(t) \rightarrow y_2(t) = x_2(\sin t)$

$x_3(t) \rightarrow y_3(t) = x_3(\sin t)$

Let $x_3(t) = a x_1(t) + b x_2(t)$

$x_3(\sin t) = a x_1(\sin t) + b x_2(\sin t)$

$y_3(t) = x_3(\sin t) = a y_1(t) + b y_2(t) \Rightarrow$ linear