

Moderate

Assistant Engineer (Electrical), Class 2025

Building Department

## Which of the following signals is monotonic?

A

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

B

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

C

$$x(t) = \sin(2t) + \cos(2t) - 2t$$

Correct

D

$$x(t) = \log(\cos(t))$$

### Correct Answer: C

#### Full Detailed Explanation

**Concept & Reasoning** The safest method is to differentiate candidate continuous-time functions. A derivative that keeps one sign indicates monotonic behavior. Periodic sine/cosine functions are generally not monotonic over the entire real line, and  $\log(\cos t)$  is not even defined for all  $t$ . The trigonometric identity  $\sin(2t) + \cos(2t) = 1$  can reduce one candidate to a simple linear function, which is monotonic.

**How to Solve It in the Exam** Simplify identities before differentiating.

**Important Exam Point** Monotonic does not mean 'always positive'; it means consistently non-increasing or non-decreasing.

**Related Revision Path** This question sits in the revision path Signals and Systems → Signal Classification → Monotonic Signals .

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