Concept Question 2-1: What three properties must an LTI system have?

The *scaling property*, which states that if the response to input $x(t)$ is output $y(t)$, then the response to input $cx(t)$ is output $cy(t)$ for any constant c.

The *additivity property*, which states that if the response to input $x_1(t)$ is output $y_1(t)$,and the response to input $x_2(t)$ is output $y_2(t)$, then the response to input $(x_1(t) + x_2(t))$ is output $(y_1(t) + y_2(t))$.

The additivity and scaling properties together are called the *superposition property*. A system with these two properties is linear.

The third property of a LTI system is *time invariance*, which states that if the response to input $x(t)$ is output $y(t)$, then the response to input $x(t – T)$ is output $y(t – T)$ for any constant T. A linear system that is also time-invariant is linear time-invariant (LTI).