

## 2.8 Assessing Stability

A system has poles at  $-1$  and  $-5$  and zeros at  $1$  and  $-2$ . Is this system stable?

**Solution :**

The system is stable since the poles are the roots of the system characteristic equation which have negative real parts. The fact that the system has a zero with a positive real part does not affect its stability.

**GPT Answer:**

Given: Poles at  $-1$  and  $-5$ , and Zeros at  $1$  and  $-2$ .

All poles are in the left half of the complex plane, hence the system is stable.

**Confidence level: 100%**

**Correct**

**Claude Answer:**

To determine if the system is stable, we need to check the location of its poles. A linear time-invariant (LTI) system is stable if and only if all of its poles lie in the left half of the complex plane (i.e., the real part of each pole is negative).

Given: - Poles at  $-1$  and  $-5$

- Zeros at  $1$  and  $-2$

Step 1: Check the location of the poles.

- Pole 1:  $-1$  (real part is negative)

- Pole 2:  $-5$  (real part is negative)

Both poles have negative real parts, which means they lie in the left half of the complex plane.

Therefore, the system with poles at  $-1$  and  $-5$  and zeros at  $1$  and  $-2$  is stable.

Note that the location of the zeros does not affect the stability of the system. The stability of an LTI system depends only on the location of its poles.

**Confidence level: 100%**

**Correct**