2. False. \( M \) can be any number greater than sup \( S \).

4. False. \( \frac{c_1}{n} \) is an example.

6. False. \( \frac{c_0}{n} \) is an example.

(Ex. Prove that \( \{ \frac{c_0}{n} \} \) is not contractive).

3. Let Comment (a): \( |a - b| \neq |a + b| \) generally.

   For example, \( a = 1, b = -1 \)
   \[ |a - b| = 2 \neq |a + b| = 0 \]

Comment (b): \( |a - b| \neq |a| \) generally.

   For example, \( a = 2, b = -1 \)
   \[ |a - b| = 3 \neq |a| = 2 \]

Comment (c): \( |a + b| \neq |a| \) generally.

   E.g. \( a = 2, b = -1 \)
   \[ |a + b| = 1 \neq |a| = 2 \]

(a)

7. Note that in the definition of contractive map sequence \( 0 \leq k < 1 \) is independent of \( n \). Otherwise the sequence \( \{ a_n \} \) need not converge. For example for

\[ a_n = 1 + \frac{1}{2} + \cdots + \frac{1}{n} \]

\[ |a_{n+2} - a_{n+1}| = \frac{1}{n+2} \leq \frac{n+1}{n+2} \cdot \frac{1}{n+1} = \frac{n+1}{n+2} |a_{n+1} - a_n| \]

\[ 0 < \frac{n+1}{n+2} < 1 \]

But the sequence \( \{ a_n \} \) diverges to \( \infty \).