\[ |2 + xh| < |2 - xh| \]

Let \( xh \) be some arbitrary complex number \( a + bi \), where \( a \) and \( b \) are both real.

\[ |2 + a + bi| < |2 - a - bi| \]

\[ (2 + a)^2 + (b)^2 < (2 - a)^2 + (-b)^2 \]

\[ 4 + 4a + a^2 - b^2 < 4 - 4a + a^2 - b^2 \]

\[ 8a < 0 \]

\[ a < 0 \implies \text{Re}(xh) < 0. \] This region is the entire left half of the complex plane.

Thus, the method is A-stable.

(b) Show that the Backward Euler Method is A-stable.

By Exercise 12, \( Q(xh) = \frac{1}{1 - xh} \)

Check where \( \left| \frac{1}{1 - xh} \right| < 1 \)

\[ \left| 1 \right| < \left| 1 - xh \right| \implies \left| xh - 1 \right| > 1 \] , i.e. the complement of the interior of the disc of radius 1 with center 1. This region contains the left half of the complex plane, so the method is A-stable.