1. (1/(N+1) points) Consider the sequence \( \{x_i\} \) defined by \( x_1 = 1 \) and for \( n > 1 \)

\[
x_{n+1} = \frac{1}{\sqrt{2}} \sqrt{1 - \sqrt{1 - x_n^2}}.
\]

Does the limit

\[
\lim_{n \to \infty} x_n
\]

exist? If it does, find its value.