

### Problem 3

In the following problems, find the limit of the given sequence as  $n \rightarrow \infty$ .

$$\frac{(-1)^n \sqrt{n+1}}{n}$$

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#### Solution

Take the limit as  $n \rightarrow \infty$ .

$$\begin{aligned} \lim_{n \rightarrow \infty} \frac{(-1)^n \sqrt{n+1}}{n} &= \lim_{n \rightarrow \infty} (-1)^n \sqrt{\frac{1}{n^2}(n+1)} \\ &= \lim_{n \rightarrow \infty} (-1)^n \sqrt{\frac{1}{n} + \frac{1}{n^2}} \\ &= \left[ \lim_{n \rightarrow \infty} (-1)^n \right] \left( \lim_{n \rightarrow \infty} \sqrt{\frac{1}{n} + \frac{1}{n^2}} \right) \\ &= \left[ \lim_{n \rightarrow \infty} (-1)^n \right] (0) \\ &= 0 \end{aligned}$$