Problem of the Week-4: Limit of a Product

Find the exact value of

$$\lim_{n\to\infty} \frac{1}{n^4} \prod_{j=1}^{2n} (n^2 + j^2)^{\frac{1}{n}}$$

Fully justify your answer.

Hint: It is possible to convert this product to a sum and realize it as a Riemann sum