

## Answer on Question #78435 – Math – Complex Analysis

### Question

Find the sum of the 5th roots of unity.

### Solution

$$1 = e^{2\pi i}.$$

$$\sqrt[5]{1} = \sqrt[5]{e^{2\pi i}} = e^{\frac{2\pi i}{n}m}, \quad m = 0, 1, 2, 3, 4.$$

Sum of the roots:

$$S = \sum_{m=0}^4 e^{\frac{2\pi i}{n}m} = \sum_{m=0}^4 \left( e^{\frac{2\pi i}{n}} \right)^m = \frac{1 - \left( e^{\frac{2\pi i}{n}} \right)^5}{1 - e^{\frac{2\pi i}{n}}} = \frac{1 - e^{2\pi i}}{1 - e^{\frac{2\pi i}{n}}} = 0.$$