Answer on Question #78435 – Math – Complex Analysis

Question

Find the sum of the 5th roots of unity.

Solution

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

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

Sum of the roots:

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

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