

## Answer on Question #80637 – Math – Complex Analysis

### Question

Solve  $i^i$ .

### Solution

$$i^i = e^{\ln i^i} = e^{i \ln i}.$$

Since  $\ln i = \ln|i| + i\left(\frac{\pi}{2} + 2\pi k\right)$  for  $k \in \mathbb{Z}$ ,

$$i \ln i = i\left(\ln|i| + i\left(\frac{\pi}{2} + 2\pi k\right)\right) = i\left(\ln 1 + i\left(\frac{\pi}{2} + 2\pi k\right)\right) = i\left(0 + i\left(\frac{\pi}{2} + 2\pi k\right)\right) = i^2\left(\frac{\pi}{2} + 2\pi k\right) = -\left(\frac{\pi}{2} + 2\pi k\right).$$

Therefore,

$$i^i = e^{\ln i^i} = e^{i \ln i} = e^{-\left(\frac{\pi}{2} + 2\pi k\right)} \text{ for } k \in \mathbb{Z}.$$

**Answer:**  $i^i = e^{-\left(\frac{\pi}{2} + 2\pi k\right)}$  for  $k \in \mathbb{Z}$ .