

## Problem 6

In each of Problems 1 through 6, use Euler's formula to write the given expression in the form  $a + ib$ .

$$\pi^{-1+2i}$$

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### Solution

Euler's formula states that  $e^{ix} = \cos x + i \sin x$ .

$$\begin{aligned}\pi^{-1+2i} &= e^{\ln \pi^{-1+2i}} \\ &= e^{(-1+2i) \ln \pi} \\ &= e^{-\ln \pi + 2i \ln \pi} \\ &= e^{\ln \pi^{-1} + 2i \ln \pi} \\ &= e^{\ln \pi^{-1}} e^{2i \ln \pi} \\ &= \pi^{-1} [\cos(2 \ln \pi) + i \sin(2 \ln \pi)] \\ &= \frac{\cos(2 \ln \pi)}{\pi} + i \frac{\sin(2 \ln \pi)}{\pi} \\ &\approx -0.210 + 0.240i\end{aligned}$$