MATH 307: Individual Homework 3

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Problem 1

$i = 1(\cos\frac{\pi}{2} + \sin\frac{\pi}{2}) = e^{i\frac{\pi}{2}}$ and by De Moivre's theorem and Euler's formula, $i^{1/4} = 1(\cos\frac{\frac{\pi}{2}+2\pi k}{4} + i\sin\frac{\frac{\pi}{2}+2\pi k}{4})$, where $k = 0, 1, 2, 3$
The four distinct roots in polar form are:
$(1, \frac{\pi}{8}), (1, \frac{5\pi}{8}), (1, \frac{9\pi}{8}), (1, \frac{13\pi}{8})$

Problem 2

$z = 2(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}) = 2(\frac{1}{2} + \frac{\sqrt{3}}{2}) = 1 + i\sqrt{3}$
$z^{-1} = \frac{1}{z} = \frac{1}{1+i\sqrt{3}} = \frac{1}{1+i\sqrt{3}} \times \frac{1-i\sqrt{3}}{1-i\sqrt{3}} = \frac{1-i\sqrt{3}}{1+3} = \frac{1}{4} - \frac{\sqrt{3}}{4}i$

Problem 3

$z = 1 - i = \sqrt{2}(cos\frac{7\pi}{4} + isin\frac{7\pi}{4})$
$z^{10} = (\sqrt{2})^{10}(cos\frac{10\times7\pi}{4} + isin\frac{10\times7\pi}{4}) = 32(\cos\frac{35\pi}{2} + i\sin\frac{35\pi}{2}) = 0 - i32$