Complex Analysis

Math 312	MWF 10:30-11:25am
Spring 1996	201 Fowler

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Worksheet #4 (01/29/96)

SUMMARY Exponential forms and power and roots

We define

$$e^{i\theta} = \cos\theta + i\sin\theta$$

We can use this identity to write complex variables in *exponential form*.
This is z in polar form

$$z = |z|(\cos + i\sin\theta) = r\text{cis}\theta$$

This is z in exponential form

$$z = |z|e^{i\theta} = re^{i\theta}$$

(Note, $\theta = arg z$ in both forms)
Write down z^n in exponential form in **two** different ways.

Using our first identity we can derive **De Moivre's Formula**

$$(\cos\theta + i\sin\theta)^m = \cos m\theta + i\sin m\theta$$

We now know how to deal with real integer powers of complex numbers in a nice way.
What about real fractional powers of complex numbers, i.e. roots?
Solve

$$z^n = 1, \qquad n = 1, 2, 3 \ldots$$

On the following axes, draw the representations of the *n-th roots of unity* when $n = 2$, $n = 3$ and $n = 4$.

What do you think the 5th roots of unity will look like?