

# Homework #1

Reading: Handout

Ref: Churchill, R. V. "Complex Variables and Applications" McGraw Hill

1. Find polar representations for the following complex numbers:

a)  $-i$                       b)  $2 + 5i$                       c)  $\sqrt{i}$                       d)  $\cos\left(\frac{1}{2}\right) - i \sin\left(\frac{1}{2}\right)$

2. Find rectangular representations for the following complex numbers:

a)  $-3e^{2i}$                       b)  $2e^{i\pi}$                       c)  $e^{(a+ib)}$                       d)  $\frac{i}{(a-i)}$

3. Find all 3 roots of  $\sqrt[3]{1+i}$  , all 5 solutions to:  $(z+1)^5 = 1$

4. Surprisingly,  $i^i$  is real! -- can you find all solutions? Hint:  $a^b = e^{b \log a}$

5. Use the Taylor Expansion for  $\cos(z) = 1 - \frac{z^2}{2!} + \frac{z^4}{4!} - \frac{z^6}{6!} \dots$  to find a simple expression for the (Real) value of  $\cos(i)$  .