

29:171 - Homework Assignment #1

1. Prove

$$e^{z_1} e^{z_2} = e^{z_1+z_2}$$

for any pair of complex numbers z_1 and z_2 . Use the definition

$$e^z = 1 + z + \frac{z^2}{2!} + \frac{z^3}{3!} + \cdots = \sum_{n=0}^{\infty} \frac{z^n}{n!}.$$

2. Find the real and imaginary part of $\sin(z)$ and $\cos(z)$. Express your results in terms of real valued functions.
3. Show that zz^* is always real and non-negative.
4. Use the quadratic formula to factorize the polynomial

$$P(z) = z^2 + 3z + 12.$$

Use complex arithmetic to verify that the polynomial is recovered by multiplying the factors.

5. Calculate the real and imaginary parts of

$$\frac{10 + i5}{7 - i6}.$$

- 6 Find the modulus and argument of $\cos(ix)$.