

**AMATH 567: Applied Complex Variables. Autumn 2020**

**Homework Assignment #1**

**Due: Wednesday, October 14, 2020**

**Please upload to Canvas by midnight**

1. From AF: 1.1.1: b-d. Problems copied below:

Express each of the following in polar exponential form:

(b)  $-i$

(c)  $1+i$

(d)  $\frac{1}{2} + \frac{\sqrt{3}}{2}i$

2. From AF: 1.1.2. Problems copied below:

Express each of the following in the form of  $a+bi$ , where  $a$  and  $b$  are real.

(a)  $e^{2+i\pi/2}$

(b)  $\frac{1}{1+i}$

(c)  $(1+i)^3$

(d)  $|3+4i|$

(e)  $\cos(i\pi/4 + c)$ , where  $c$  is real.

3. AF 1.1.3: a,b

Solve for the roots of the following equation:

(a)  $z^3 = 4$

(b)  $z^4 = -1$

4. AF 1.1.4: a,d,e,f

Establish the following result:

(a)  $(z+w)^* = z^* + w^*$

(d)  $\operatorname{Re} z \leq |z|$

(e)  $|wz^* + w^*z| \leq 2|wz|$

5. Prove the triangle inequality

$$\left| \sum_{j=1}^N z_j \right| \leq \sum_{j=1}^N |z_j|$$

What is the condition for equality?