

CPE 381: Classwork 1  
Mathematical preliminaries

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① Plot the following complex numbers on the complex plane:

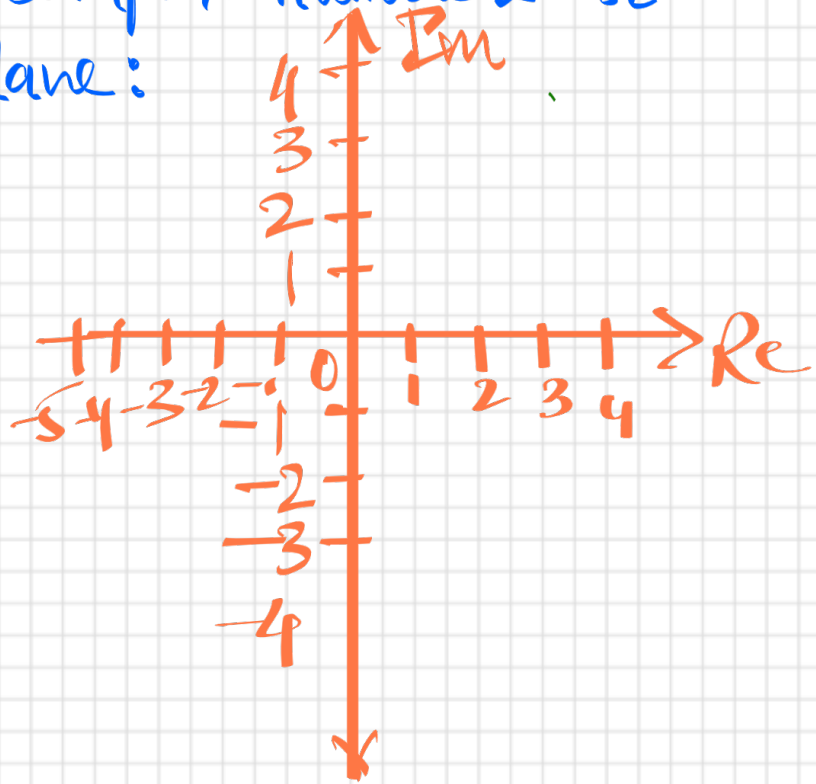
4pts

(a)  $2 + i3$

(b)  $3 - i2$

(c)  $-2 - i2$

(d)  $-4 + j2$



② Express  $\frac{-1 + 3i}{2 + 5i}$  in the form  $a + ib$

4pts

③ If  $z = 3 + i5$  is a complex number, what is the value of the modulus  $|z|$

2pts

④ Find the roots of equation  $x^2 + x + 1 = 0$ .

4pts

⑤ Write the following complex number in the polar form: (a)  $z = 1 + i$  (b)  $w = \sqrt{3} - i$

2pts

⑥ Find the product of the complex numbers  
4pts  $1+i$  and  $\sqrt{3}-i$  in the polar form.

⑦ Find  $(\frac{1}{2} + \frac{1}{2}i)^{10}$  2pts

⑧ Evaluate or simplify:

2pts

(a)  $e^{i\pi}$

(b)  $e^{-1+i\pi/2}$

⑨ Evaluate the expression below and write your answer

6pts

(a)  $(5-i6) + (3+i2)$

(b)  $\frac{12+i7}{1+i7}$

(c)  $\frac{3}{4-i3}$

⑩ Find the complex conjugate and modulus of the number.

6pts

(a)  $12-15$

(b)  $-1+2\sqrt{2}i$

(c)  $-4i$

⑪ Apply De Moivre's Theorem to simplify:

6pts

(a)  $(1+i)^{20}$

(b)  $(1-\sqrt{3}i)^5$

(c)  $(1-i)^8$

(b) Use Euler's formula to prove the following formulas for  $\cos x$  and  $\sin x$ :

upts (a)  $\cos x = \frac{e^{ix} + e^{-ix}}{2}$

(b)  $\sin x = \frac{e^{ix} - e^{-ix}}{2i}$

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