



Worksheet 1

Fri, Feb 1

Spring 2019

Roll# Student 1:
Roll# Student 2:

Roll# Evaluator 1:
Roll# Evaluator 2:

Problem 1

For each of the following complex numbers,

- | | | |
|---------------------|------------------------------------------|------------------------------------------|
| (a) $1 + i$ | (d) $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ | (g) $-\frac{1}{2} - \frac{\sqrt{3}}{2}i$ |
| (b) $1 - \sqrt{3}i$ | (e) $z = -\sqrt{3} + 3i$ | (h) $7 + 3i - 8 - 4i$ |
| (c) $-i$ | (f) $-\sqrt{3} + i$ | (i) $(-8 - 4i) - (-8 - 5i)$ |

- (i) Simplify and plot in the complex plane.
- (ii) Express in all the three polar forms i.e. phasor, trigonometric and exponential. Use θ as the **principal argument**. Express answers both in radians and degrees where appropriate.
- (iii) Write down their conjugates in all the three polar forms.

Problem 2

For each of the following complex numbers,

- | | | |
|-------------------------------------------------|---------------------------------------------------|----------------------------------------------------|
| (a) $2\angle 30^\circ$ | (d) $9e^{-i\frac{\pi}{4}}$ | (h) $5(\cos \frac{\pi}{6} - i \sin \frac{\pi}{6})$ |
| (b) $(2\angle 30^\circ).(2\angle 30^\circ)$ | (e) $e^{i\frac{\pi}{6}}$ | (i) $2(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2})$ |
| (c) $\frac{4\angle 90^\circ}{2\angle 45^\circ}$ | (f) $(9e^{-i\frac{\pi}{4}}).(e^{i\frac{\pi}{6}})$ | (j) $5\angle 60^\circ - e^{i\frac{\pi}{6}}$ |
| (g) $25(\cos 45^\circ + i \sin 45^\circ)$ | | |

- (i) Simplify and plot in the complex plane.
- (ii) Express the complex number in Cartesian form.

Problem 3

Using the property that when complex numbers are multiplied together, their arguments add up, find the principal arguments in radians of the following complex numbers and plot these on the complex plane.

- | | | |
|---------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------|
| (a) $(-1 + i)^3$ | (e) $(1 + 0i)^5$ | (i) $(\sqrt{4} - i\sqrt{12})^6$ |
| (b) $(1 + i\sqrt{3})^2$ | (f) $(\sqrt{3} + i)^7$ | (j) $\left(-\frac{1}{2} - i\frac{\sqrt{3}}{2}\right)^3$ |
| (c) $(-i)^2$ | (g) $(7 + 3i - 8 - 4i)^6$ | |
| (d) $\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^4$ | (h) $\left(\left(\frac{7}{11} - 4i\right) - \left(\frac{13}{22} - 5i\right)\right)^2$ | |