

## Assignment 1: Modern Physics

### Due Date: 5th February 2018, 4 pm

1. Give the answer of the following in polar and rectangular form.

$$z^2 = 8(1 + \sqrt{3} i)$$

$$z^2 = -5(1 - \sqrt{7} i)$$

2. Let  $z_1 = 3 + 5 i$ ,  $z_2 = 4 + 2 i$ , and  $z_3 = 6 - i$  are the complex numbers. Find

(a)  $z_1 + z_2$

(b)  $z_1 - z_2 + z_3$

(c)  $z_1 z_2 z_3$

(d)  $z_1 / z_3$

(e)  $1/z_1^2, 1/\sqrt{z_1}$

(f)  $|z_1 + z_2|, |z_2 - z_3|, |z_1|$

Also show these on Argand Diagram.

3. Simplify (a)  $i^2$  (b)  $i^3$  (c)  $i^4$  (d)  $1/i$  (e)  $1/i^2$  (f)  $1/i^3$ .

4. If  $z_1 = e^{ik_1 x}$  and  $z_2 = e^{ik_2 x}$ , find

(a)  $z_1 + z_2$

(b)  $z_1 - z_2$

(c)  $\text{Re}\{z_1 + z_2\}$  and  $\text{Re}\{z_1 - z_2\}$

(d)  $z_1 / z_2$

(e)  $z_1 \cdot z_2$

5. Let  $z_1 = 5e^{i(kx + \frac{\pi}{4})}$  and  $z_2 = 6e^{i(kx - \frac{\pi}{3})}$ . Find and plot

(a)  $\text{Re}\{z_1\}$  and  $\text{Im}\{z_1\}$  as a function of  $x$ ,

(b)  $\text{Re}\{z_2\}$  and  $\text{Im}\{z_2\}$  as a function of  $x$ ,

(c) Find  $|z|, |z_1 + z_2|$ .