

EEL 3135: Signals and systems

Fall 2018

Homework # 1

Solve all the problems with check marks in the second sheet of paper except number 34, 35, and 36



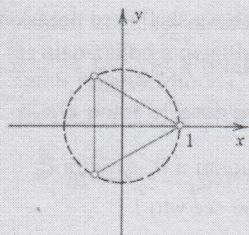


Fig. 291.  $\sqrt[3]{1}$

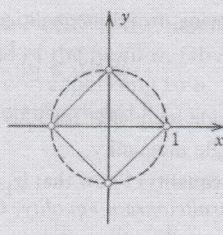


Fig. 292.  $\sqrt[4]{1}$

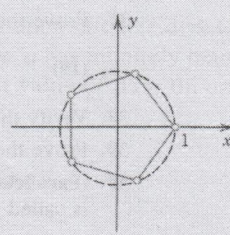


Fig. 293.  $\sqrt[5]{1}$

The student should do the problems related to the polar representation with particular care, since we shall need this representation quite often in our work.

### Problem Set 12.2

1. (Multiplication by  $i$ ) Show that multiplication of a complex number by  $i$  corresponds to a counterclockwise rotation of the corresponding vector through the angle  $\pi/2$ .

Find

- |               |                                    |                   |  |               |  |
|---------------|------------------------------------|-------------------|--|---------------|--|
| $\sqrt[3]{2}$ | $  -0.2i  $                        | 3. $  1.5 + 2i  $ | 4. $  z  ^4,   z^4  $                  | $\sqrt[5]{5}$ | $ \cos \theta + i \sin \theta $                  |
| $\sqrt[3]{6}$ | $\left  \frac{\bar{z}}{z} \right $ | $\sqrt[3]{7}$     | $\left  \frac{5 + 7i}{7 - 5i} \right $ | $\sqrt[3]{8}$ | $\left  \frac{(1 + i)^6}{i^3(1 + 4i)^2} \right $ |

Represent in polar form:

- |                           |                                |   |                             |
|---------------------------|--------------------------------|---|-----------------------------|
| 10. $2i, -2i$             | 11. $1 + i$                    | 12. $-3$                                      | 13. $6 + 8i$                |
| 14. $\frac{1 + i}{1 - i}$ | 15. $\frac{i\sqrt{2}}{4 + 4i}$ | 16. $\frac{3\sqrt{2} + 2i}{-\sqrt{2} - 2i/3}$ | 17. $\frac{2 + 3i}{5 + 4i}$ |

Determine the principal value of the arguments of

- |               |               |            |              |
|---------------|---------------|------------|--------------|
| 18. $-6 - 6i$ | 19. $-10 - i$ | 20. $-\pi$ | 21. $2 + 2i$ |
|---------------|---------------|------------|--------------|

Represent in the form  $x + iy$ :

- |                |  |                |  |
|----------------|--|----------------|--|
| $\sqrt[3]{22}$ | $4(\cos \frac{1}{3}\pi + i \sin \frac{1}{3}\pi)$ | $\sqrt[3]{23}$ | $2\sqrt{2}(\cos \frac{3}{4}\pi + i \sin \frac{3}{4}\pi)$ |
| $\sqrt[3]{24}$ | $10(\cos 0.4 + i \sin 0.4)$                      | $\sqrt[3]{25}$ | $\cos(-1.8) + i \sin(-1.8)$                              |

Find all values of the following roots and plot them in the complex plane.

- |                |                      |                |                |                |                   |                |                   |
|----------------|----------------------|----------------|----------------|----------------|-------------------|----------------|-------------------|
| $\sqrt[3]{26}$ | $\sqrt{i}$           | $\sqrt[3]{27}$ | $\sqrt{-8i}$   | $\sqrt[3]{28}$ | $\sqrt{-7 - 24i}$ | $\sqrt[3]{29}$ | $\sqrt[8]{1}$     |
| $\sqrt[3]{30}$ | $\sqrt[4]{-7 + 24i}$ | $\sqrt[3]{31}$ | $\sqrt[4]{-1}$ | $\sqrt[3]{32}$ | $\sqrt[5]{-1}$    | $\sqrt[3]{33}$ | $\sqrt[3]{1 + i}$ |

Solve the equations:

- |                |                                   |                |                              |
|----------------|-----------------------------------|----------------|------------------------------|
| $\sqrt[3]{34}$ | $z^2 + z + 1 - i = 0$             | $\sqrt[3]{35}$ | $z^2 - (5 + i)z + 8 + i = 0$ |
| $\sqrt[3]{36}$ | $z^4 - 3(1 + 2i)z^2 - 8 + 6i = 0$ |                |                              |