

ECE 1250 homework # P0

If you learn to use the complex math feature of your calculator, you may use that to work the following problems. In that case you may report the answers without showing any work. Otherwise, you'll need more space than is provided here.

1. Convert the following complex numbers to polar form (m/θ or $me^{j\theta}$).

a) $1 + j$ b) $2.6 + 8.7j$ c) $3 + 4j$ d) $3 - 4j$ e) $-3 + 4j$ f) $-3 - 4j$

2. Convert the following complex numbers to rectangular form ($a + bj$).

a) $10 \cdot e^{j \cdot 60 \cdot \text{deg}}$ b) $0.4 \cdot e^{j \cdot 12 \cdot \text{deg}}$ c) $\frac{j \cdot \pi \cdot \text{rad}}{1500 \cdot e^2}$ d) $10 \cdot e^{-j \cdot 45 \cdot \text{deg}}$ e) $20 \cdot e^{j \cdot 120 \cdot \text{deg}}$ f) $30 \cdot e^{j \cdot 210 \cdot \text{deg}}$

3. Perform the following additions and subtractions of complex numbers.

a) $(3 + 2j) + (6 + 9j)$ b) $(9 - 10j) - (9 + 10j)$ c) $(-2 - 2j) + (-6 + 9j)$

d) $(3 + 0j) - (0 + 9j)$ e) $(5 + 6j) + 5 \cdot e^{j \cdot 53 \cdot \text{deg}}$ f) $(-2 + 3j) - 8 \cdot e^{-j \cdot 37 \cdot \text{deg}}$

4. Perform the following multiplications of complex numbers.

a) $(8 + j) \cdot 3$ b) $(3 + 2j) \cdot j$ c) $(20 \cdot e^{j \cdot 40 \cdot \text{deg}}) \cdot (10 \cdot e^{j \cdot 60 \cdot \text{deg}})$

d) $(-6 + 9j) \cdot (10 \cdot e^{j \cdot 60 \cdot \text{deg}})$ e) $(-2 - j) \cdot (-6 - 9j)$

5. Perform the following divisions of complex numbers.

a) $\frac{20 \cdot e^{j \cdot 40 \cdot \text{deg}}}{10 \cdot e^{j \cdot 60 \cdot \text{deg}}}$ b) $\frac{9 - 10j}{3 \cdot e^{-j \cdot 20 \cdot \text{deg}}}$ c) $\frac{3 + 0j}{0 + 9j}$ d) $\frac{-2 - 2j}{-6 + 9j}$

Answers

1. a) $1.414 \cdot e^{j45 \cdot \text{deg}}$ b) $9.08 \cdot e^{j73.4 \cdot \text{deg}}$ c) $5 \cdot e^{j53.1 \cdot \text{deg}}$ d) $5 \cdot e^{-j53.1 \cdot \text{deg}}$ e) $5 \cdot e^{j126.9 \cdot \text{deg}}$ f) $5 \cdot e^{-j126.9 \cdot \text{deg}}$

2. a) $5 + 8.66j$ b) $0.391 + 0.083j$ c) $1500j$ d) $7.071 - 7.071j$ e) $-10 + 17.321j$ f) $-25.981 - 15j$

3. a) $9 + 11j$ b) $-20j$ c) $-8 + 7j$ d) $3 - 9j$ e) $8.009 + 9.993j$ f) $-8.389 + 7.815j$

4. a) $24 + 3j$ b) $-2 + 3j$ c) $200 \cdot e^{j100 \cdot \text{deg}}$ d) $108 \cdot e^{-j176 \cdot \text{deg}}$ e) $24.2 \cdot e^{j82.9 \cdot \text{deg}}$

5. a) $2 \cdot e^{-j20 \cdot \text{deg}}$ b) $4.485 \cdot e^{-j28.01 \cdot \text{deg}}$ c) $0.333 \cdot e^{-j90 \cdot \text{deg}}$ d) $-0.051 + 0.256j$