

ELEG 305 Spring 2019

Math Practice Problems

Extra Credit (20 points)

1. Find the roots of

(a) $x^2 + 2x - 15$

(b) $x^3 + 12x^2 + 27x$

2. Evaluate (please, no calculators)

(a) $\tan 30^\circ$

(b) If $\sin \theta = \frac{1}{3}$, what is $\cos \theta$?

(c) $\cos 45^\circ$

3. Multiply the following (with $j = \sqrt{-1}$)

(a) $(3 + 4j)(1 - 2j)$

(b) $(3 + 4j)(1 - 2j)^*$, where $*$ denotes conjugate

(c) $\frac{1}{2 + j}(\frac{3 + 4j}{1 + j})$ rationalize denominator after multiplying

4. Convert to polar coordinates (i.e., $re^{j\theta}$)

(a) $1 - j$

(b) $-2 + j$

(c) $\frac{4 + 3j}{1 - j}$

5. Convert to rectangular coordinates (use Euler's Relation)

(a) $e^{j\frac{\pi}{3}}$

(b) $3e^{j\frac{\pi}{6}}$

(c) $2e^{j\frac{\pi}{2}} + 3e^{-j\frac{\pi}{2}}$

6. Compute the absolute value of

(a) $e^{j\frac{\pi}{3}}$

(b) $3 + 4j$

(c) $2e^{j\frac{\pi}{2}}$

7. Compute the real part of

(a) $2e^{j\frac{\pi}{2}} + 3e^{-j\frac{\pi}{2}}$

(b) $(3 + 4j)(1 - 2j)$

(c) $5e^{j\frac{\pi}{3}}$

8. Differentiate

(a) $\sin^2 \theta \cos \theta$

(b) $x^2\sqrt{1-x^2} + \frac{3}{1-x}$

(c) $\frac{x \sin x}{\sqrt{1+x}}$

9. Integrate (please do not use tables)

(a) $\int_0^\pi \cos 2\theta \, d\theta$

(b) $\int_0^4 e^{-4x} \, dx$

(c) $\int_0^\infty xe^{-x} \, dx$

(d) $\int_1^2 \frac{1}{(x+a)(x+b)} \, dx, a \neq -1 \text{ or } -2, b \neq -1 \text{ or } -2. \text{ Use partial fraction expansion.}$

10. Compute the sum

(a) $\sum_{k=0}^\infty \left(\frac{1}{3}\right)^k$

(b) $\sum_{k=0}^\infty z^k, |z| < 1$

(c) $\sum_{k=0}^4 (-3)^k$

(d) $\sum_{n=0}^5 (-2)^{n-1}$