**Homework 1: Complex Number**

**Prob 1.1: Express the following complex numbers in form \(a + jb\):**

- a) \(\frac{1}{j^2}\)
- b) \(\frac{1}{2-j}\)
- c) \(\frac{1}{c+jd}\)
- d) \(\frac{1-j}{1+j}\)
- e) \(\frac{1}{e^{j\pi}}\)
- f) \(\frac{1+1j}{(3-j)(1-j)}\)

**Prob 1.2: Express the following complex numbers in form \(r∠\theta\):**

- a) 1
- b) \(j\)
- c) -1
- d) \(-j\)
- e) \(1+j\)
- f) \(1-j\)
- g) \(-1+j\)
- h) \(-1-j\)
- i) \(e^{2+j}\)
Prob1.3: Put the following complex numbers in Cartesian form:

a) \((1 + j)^2\)

b) \((1 + j)^{11}\)

c) \(\frac{3+j4}{1-j2}\)

d) \(\sqrt[3]{1+j}\)

Prob1.4: Put the following complex numbers in Cartesian form:

\[\frac{1}{2^{168}} \left(\frac{1+j5}{2+j3}\right)^{348}\]
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**Prob1.5:** Find all $z$ (in form $r∠θ$) which satisfy:

a) $z^6 + 8 = 0$

b) $z^3 - 4 = 0$

c) $z^7 = 1$

**Prob1.6:** Find all solutions (in form $a + jb$) of each equation:

a) $z^4 - 16 = 0$

b) $z^3 - 3z^2 + 6z - 4 = 0$

c) $(z + 1)^5 = z^5$