Pmat 421
Assignment # 3 due by Monday March 10 , 4pm.

Each questions is worth 5 points.

1. Find all solutions of $\sin z = i$ in the form of $a + ib, a, b$ real.
   Which one is the pricipal value?

2. Find all values of (a) i^{-1-i}
   (b) $(-1-i)^i$ in the form of $a + ib, a, b$ real.

3. Solve for z: $\cos z = i \sin z$ if possible.

4. Find the domain of definition and derivative of
   (a) $f(z) = \tan^3 z$;
   (b) $f(z) = \cos 2z + \sin \frac{1}{z}$.

5. For $f(z) = Log(3z - i)$ find the domain D where the function is analytic and then $f'(z)$ in D.(Log is the principal branch.)

6. Solve for all z $Log(z^2 - 1) = i\frac{\pi}{2}$.

7. Evaluate the following limit if it exists: $\lim_{z \to \infty} e^{-z}$

8. Evaluate $\int_0^1 (1 + 2it)^3 \, dt$ in the form of $a + ib, a, b$ real.

9. Evaluate $\int_0^2 \frac{t}{(t^2 + i)^2} dt$.in the form of $a + ib, a, b$ real.

10. Evaluate $\int_{-2}^0 (1 + i) \cos it \; dt$ in the form of $a + ib, a, b$ real.

    BONUS QUESTION for 10 points:

11. Find the conditions on a function f which is analytic in a domain D such that $\mathrm{Re}(f'(z)) = 0$ for all $z \in D$.