Practice Problem 1

1. Evaluate (a) $(\sqrt{3} - j)^6$; (b) $\frac{5j}{2+j}$; (c) $(-1+j)^7$; (d) $(-8 - 8\sqrt{3}j)^{1/4}$.

2. Find $u(x,y)$ and $v(x,y)$ if $f(z)$ is given by (a) $\sin z$; (b) $\frac{1}{z^2+1}$.

3. Evaluate $\int_C f(z)dz$ where the contour C is the unit circle $|z| = 1$ described in the positive sense: (a) $f(z) = \frac{z^2}{z-3}$; (b) $f(z) = ze^{-z}$.

4. Expand $\sin z$ into a Taylor series about the point $z_0 = 0$.

5. Find the residue of $f(z)$ at the points indicated if $f(z)$ is given by (a) $\frac{1}{z(z-b)}$ at $z = 0, b$; (b) $\frac{z}{z^2+1}$ at $z = \pm j$.

6. Evaluate the integral of each of these functions around the circle $|z| = 3$ in the positive sense: (a) $\frac{e^{-z}}{z^2}$; (b) $\frac{z+1}{z^2-2z}$.

7. Evaluate the integral $\int_0^{2\pi} \frac{\cos 2\theta}{a+b\cos\theta} d\theta$ for $a > b > 0$.

8. Find the Laplace transforms of the following functions: (a) $t\sin 2t$; (b) $e^{-t}t^3$; (c) $\cosh\sqrt{2}t + \cos\sqrt{2}t$; (d) $\frac{e^{-2t}}{t}$.