UEC-404 Signals & Systems

Tutorial #1

[1]	(you all do team work!!) Express each of the following complex numbers in Cartesian form $(x + jy)$: $\frac{1}{2}e^{j\pi}$, $\frac{1}{2}e^{-j\pi}$, $e^{j\pi/2}$, $e^{5j\pi/2}$, $\sqrt{2}e^{j\pi/4}$, $\sqrt{2}e^{-j9\pi/4}$
[2]	(you all do team work!!) Express each of the following complex numbers in polar form $\left(re^{j\theta}, \text{with} -\pi < \theta \leq \pi\right)$: $5,\ -2,\ -3j,\ \frac{1}{2} - j\frac{\sqrt{3}}{2},\ 1 + j,\ (1-j)^2,\ j(1-j),$ $(1+j)/(1-j),\ \left(\sqrt{2} + j\sqrt{2}\right)/\left(1 + j\sqrt{3}\right)$
[3]	(you all do team work!!) Multiply $A = 10\angle 53.1°$ by $B = 5\angle -36.9°$
[4]	(you all do team work!!) Let z denote a complex variable; that is, $z = x + jy = re^{j\theta}$. The *complex conjugate* of z is $z^* = x - jy = re^{-j\theta}$. Derive each of the following relations, where z, z_1, and z_2 are arbitrary numbers: **(a)** $zz^* = r^2$ **(b)** $\frac{z}{z^*} = e^{j2\theta}$ **(c)** $z + z^* = 2\,Re\{z\}$ **(d)** $z - z^* = j2Im\{z\}$ **(e)** $(z_1 + z_2)^* = {z_1}^* + {z_2}^*$ **(f)** $(az_1z_2)^* = a{z_1}^*{z_2}^*$, where a is any real number.
[5]	(you all do team work!!) Evaluate each of the following integrals, and express your answer in Cartesian (rectangular) form: **(a)** $\int_0^4 e^{j\pi t/2}\,dt$ **(b)** $\int_0^6 e^{j\pi t/2}\,dt$ **(c)** $\int_2^8 e^{j\pi t/2}\,dt$ **(d)** $\int_0^\infty e^{-(1+j)t}\,dt$ **(e)** $\int_0^\infty e^{-t}\cos(t)\,dt$ **(f)** $\int_0^\infty e^{-2t}\sin(3t)\,dt$