

1. Show that $u(x, y) = -2xy + e^y \sin x$ is harmonic then find its harmonic conjugate v .
2. Let v be the harmonic conjugate of u . Show that $h = u^2 - v^2$ is a harmonic function.
3. Find all values of z for which the following equations hold:
 - (a) $e^z = -6$
 - (b) $e^z = 1 - i\sqrt{3}$.
 - (c) $\text{Log}(z - 1) = 1 + \frac{i\pi}{3}$.
4. Find the principal value of $\text{Log}z$ for each of the following :
 - (a) $\text{Log}(1 - i)$
 - (b) $\text{Log}(\sqrt{3} - i)$
5. Find all values of $(1 - i)^{2+i}$.