Answer Set - 10

AUTUMN 2017

MATHEMATICS - I(MA10001)

August , 2017

1. **Find the following limits:**
   (a) Limit does not exist.
   (b) Limit does not exist.
   (c) Limit does not exist.
   (d) Limit does not exist.
2. **Test the continuity of the following functions:**
   (a) Not continuous at $z = 0$.
   (b) Continuous at $z = 0$.
   (c) Not continuous at $z = 0$.
3. $f(z)$ is not continuous at $z = 0$ (put $y^2 = mx$).
4. To show $f'(0)$ does not exist, put $y = mx$.
5. To show $f'(0)$ does not exist, put $y = mx^2$.
6. Apply Cauchy Reimann equations.
7. Write $\text{Ln}z = \frac{1}{2}\ln(x^2 + y^2) + i\tan^{-1}\frac{y}{x}$ and apply Cauchy Reimann equations.
8. (a) Use $f'(z) = u_x + iv_x = 0 = v_y - iu_y$.
   (b) Apply Cauchy Reimann equations on the expression of $f'(z)$.
   (c) Apply Cauchy Reimann equations on the expression of $f'(z)$.
   (d) Differentiate(partially) $|f(z)| = c$ with respect to x and y and then eliminate u_y.
9. Show that $u_{xx} + u_{yy} = 0$. To find its harmonic conjugate use $dv = v_x dx + v_y dy = -u_y dx + u_x dy$.
10. Show that Laplace equation is satisfied. To find $f(z)$ apply Cauchy Reimann equations and integrate.
11. Apply Laplace equation in polar coordinate. To find $f(z)$ apply Cauchy Reimann equations in polar coordinate and integrate.
12. (a) Use $x = \frac{z+\bar{z}}{2}$ and $y = \frac{z-\bar{z}}{2i}$ and differentiate x and y with respect to z and $\bar{z}$.
    (b) Use the result of (a).
13. (a) Use chain rule of differentiation.
    (b) Use chain rule differentiation.
    (c) use (a) and (b).
14. Use Cauchy Reimann equations.
15. Use $\frac{\partial}{\partial x} = \cos\theta\frac{\partial}{\partial r} - \frac{\sin\theta}{r}\frac{\partial}{\partial\theta}$ and $\frac{\partial}{\partial y} = \sin\theta\frac{\partial}{\partial r} + \frac{\cos\theta}{r}\frac{\partial}{\partial\theta}$.