

Complex Variables MA287 : Second Test

Time allowed: 50 minutes

Attempt all five questions

**Name & Id. :**

Q1. *[5 marks]*

For  $w = f(z) = (1 + z)/(1 - z)$  find  $dw/dz$  and determine where  $f(z)$  is non-analytic.

Q2. *[5 marks]*

Verify that the real and imaginary parts of  $f(z) = z^2 + 5iz + 3 - i$  satisfy the Cauchy-Riemann equations.

Q3. *[5 marks]*

Find an equation for the line normal to the curve  $x^2y = 2xy + 6$  at the point  $(3, 2)$ .

Q4. *[5 marks]*

Find the orthogonal trajectories of the family of curves  $x^3y - xy^3 = \alpha$ .

Q5. *[5 marks]*

Evaluate  $\lim_{z \rightarrow 0} (\cos z)^{1/z^2}$ .