

	<b>SRM Institute of Science and Technology Kattankulathur</b>	
	<b>DEPARTMENT OF MATHEMATICS</b>	
	<b>18MAB102T ADVANCED CALCULUS &amp; COMPLEX ANALYSIS</b>	
	<b>MODULE IV- ANALYTIC FUNCTIONS</b>	
<b>Sl.No.</b>	<b>Tutorial Sheet -1</b>	<b>Answers</b>
<b>Part – A</b>		
<b>1</b>	<b>Test whether <math>f(z) = z^3</math> is analytic.</b>	<b>Analytic everywhere</b>
<b>2</b>	<b>If <math>f(z)</math> and <math>f(\bar{z})</math> are analytic function of <math>z</math>, then prove that <math>f(z)</math> is constant.</b>	
<b>3</b>	<b>Show that the function <math>e^x(\cos y + i \sin y)</math> is analytic and find its derivative.</b>	$f'(z) = e^z$
<b>4</b>	<b>Prove that if <math>v</math> is harmonic conjugate of <math>u</math> and <math>u</math> is harmonic conjugate of <math>v</math>, then <math>f(z)</math> is constant.</b>	
<b>5</b>	<b>Show that the function <math>u = 2 \log(x^2 + y^2)</math> is harmonic.</b>	
<b>Part – B</b>		
<b>6</b>	<b>Show that an analytic function with (i) constant real part is constant (ii) constant modulus is constant.</b>	
<b>7</b>	<b>If <math>f(z) = u + iv</math> is an analytic function of <math>z</math>, show that</b> $\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right)  f(z) ^2 = 4  f'(z) ^2$	
<b>8</b>	<b>If <math>f(z) = u + iv</math> is an analytic function of <math>z</math>, show that</b> $\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) \log  f(z)  = 0$	
<b>9</b>	<b>Show that the function <math>u = e^x \cos y</math> is harmonic and find the harmonic conjugate of <math>u</math>.</b>	$v = e^x \sin y$