Cauchy-Riemann equations (polar coordinates)

Canonical name	CauchyRiemannEquationspolarCoordinates
Date of creation	2013-03-22 14:03:58
Last modified on	2013-03-22 14:03:58
Owner	Daume (40)
Last modified by	Daume (40)
Numerical id	8
Author	Daume (40)
Entry type	Definition
Classification	msc 30E99
Related topic	TangentialCauchyRiemannComplexOfCinftySmoothForms
Related topic	ACRcomplex

Suppose A is an open set in $\mathbb{C}$ and $f(z) = f(re^{i\theta}) = u(r, \theta) + iv(r, \theta)$: $A \subset \mathbb{C} \to \mathbb{C}$ is a function. If the derivative of $f(z)$ exists at $z_0 = (r_0, \theta_0)$. Then the functions u, v at z_0 satisfy:

$$\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$$
$$\frac{\partial v}{\partial r} = -\frac{1}{r}\frac{\partial u}{\partial \theta}$$

which are called *Cauchy-Riemann equations* in polar form.