```
"""Zernike
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import math

def Rmn(m,n,rho):
    R = 0
    if (n-abs(m)) % 2 == 0:
        for k in range((n-abs(m))//2+1):
            R += ((-1)**k*math.factorial(n-k)) /
(math.factorial(k)*math.factorial((n+abs(m))/2-k)*math.factorial((n-abs(m))/2-
k))*rho**(n-2*k)
    return R

def Zernike(rho,phi,m=None,n=None):
    if m==None:
        m = Zernike_xy.m
    else:
        Zernike_xy.m = m

    if n==None:
        n = Zernike_xy.n
    else:
        Zernike_xy.n = n
    if m >= 0 :
        return Rmn(m,n,rho)*math.cos(m*phi)
    else:
        return Rmn(m,n,rho)*math.sin(m*phi)

def Zernike_xy(x,y,m=None,n=None):
    """Zernike en coordonnées cartésiennes"""
    if m==None:
        m = Zernike_xy.m
    else:
        Zernike_xy.m = m

    if n==None:
        n = Zernike_xy.n
    else:
        Zernike_xy.n = n
    return Zernike(math.sqrt(x*x+y*y),math.atan2(y,x),Zernike_xy.m,Zernike_xy.n)
```