Contents

1 Euler's Homogeneous Function Theorem

Let f(x,y) be a homogeneous function of order n so that

$$f(tx, ty) = t^n f(x, y).$$

Then define $x' = xt$ and $y' = yt$. Then

$$nt^{(}n-1)f(x, y) = (\partial f)/(\partial x')(\partial x')/(\partial t) + (\partial f)/(\partial y')(\partial y')/(\partial t)$$

$$= x(\partial f)/(\partial x') + y(\partial f)/(\partial y')$$

$$= x(\partial f)/(\partial(xt)) + y(\partial f)/(\partial(yt)).$$

Let t=1, then

$$x(\partial f)/(\partial x) + y(\partial f)/(\partial y) = nf(x, y).$$