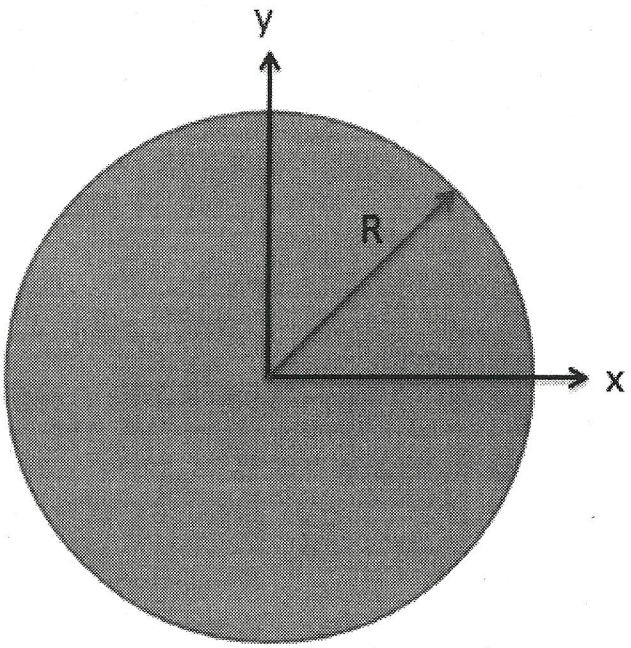
Find the polar moments of inertia for this circular area about its centroid. Leave the answer in terms of the generic radius R.



$$J_{zz} = \int_0^R dA\, r^2$$

$$J_{zz} = \int_0^R (2\pi r)(r)^2\, dr$$

$$J_{zz} = 2\pi \left| \frac{r^4}{4} \right|_0^R$$

$$\boxed{J_{zz} = \frac{1}{2}\pi R^4}$$