```
Integrate[Exp[I r (a Cos[θ] + b Sin[θ])] r, {r, 0, R}, {θ, 0, 2 π},
 Assumptions → {{a, b, R} ∈ Reals ∧ {R, a^2 + b^2} > 0}]
```

$$\pi R^2 \, \text{Hypergeometric0F1Regularized}\left[2, -\frac{1}{4}\left(a^2 + b^2\right) R^2\right]$$