= a and ? =
b , where 0 < b ? a ? 2? . Then , the area of R is
<formula>
This result can be found as follows . First , the interval [a , b] is divided into n subintervals , where n is an arbitrary positive integer . Thus ?? , the length of each subinterval , is equal to b ? a (the total length of the interval) , divided by n , the number of subintervals . For each subinterval i = 1 , 2 , ? , n , let ?i be the midpoint of the subinterval , and construct a sector with the center at the pole , radius r (?i) , central angle ?? and arc length r (?i) ?? . The area of each constructed sector is therefore equal to
<formula>
Hence , the total area of all of the sectors is
<formula>
As the number of subintervals n is increased , the approximation of the area continues to improve . In the limit as n ? ? , the sum becomes the Riemann sum for the above integral .
A mechanical device that computes area integrals is the planimeter , which measures the area of plane figures by tracing them out : this replicates integration in polar coordinates by adding a joint so that the 2 @-@ element linkage effects Green 's theorem , converting the quadratic polar integral to a linear integral .

= = = = Generalization = = = =