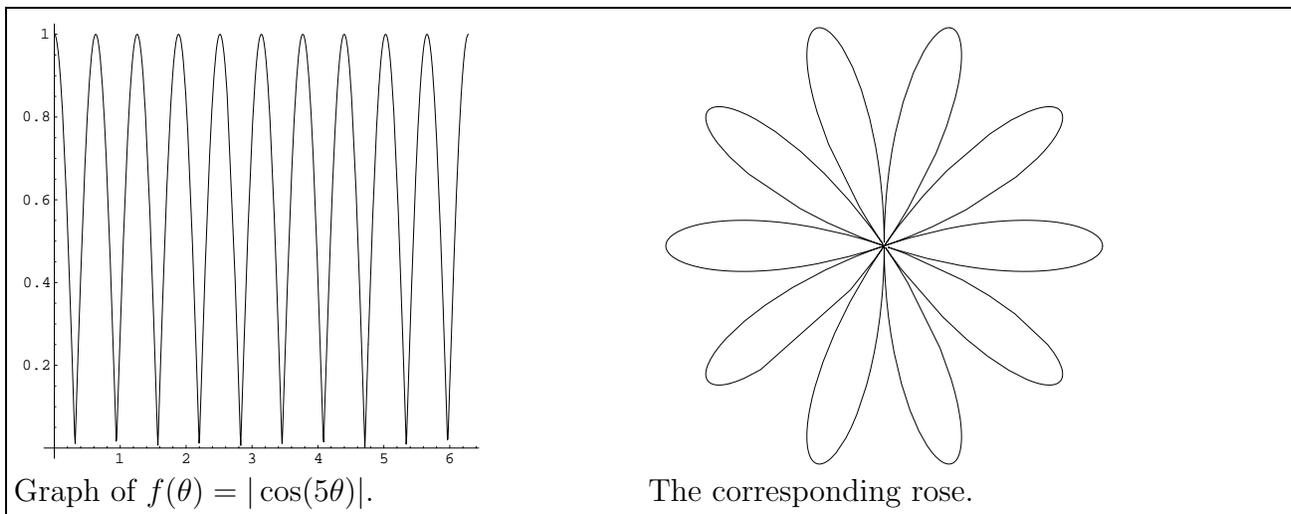


Roses are regions defined in polar coordinates as  $\{(\theta, r) \mid 0 \leq r \leq f(\theta)\}$ , where  $f(\theta)$  is a periodic function of  $\theta$ . The picture above to the right for example shows a rose defined by

$$f(\theta) = |\cos(4t) + \sin(11t)/5| .$$



1) The area of a rose is  $\int_0^{2\pi} \int_0^{f(\theta)} 1$    $drd\theta$ .

2) Write down a single integral for the area of the rose.

3) Calculate the area of the rose defined by  $f(\theta) = |\cos(5\theta)|$  (Use  $\cos^2(\theta) = (\cos(2\theta) + 1)/2$ ).