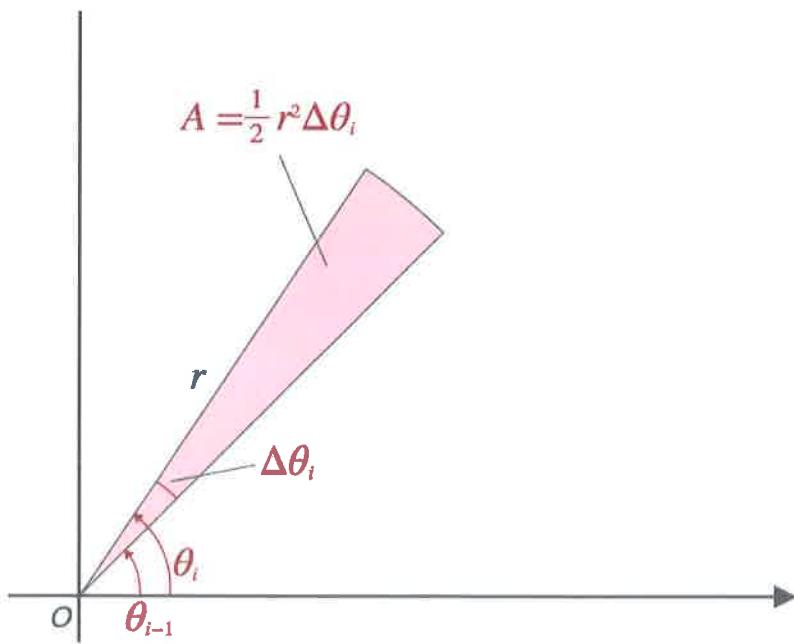
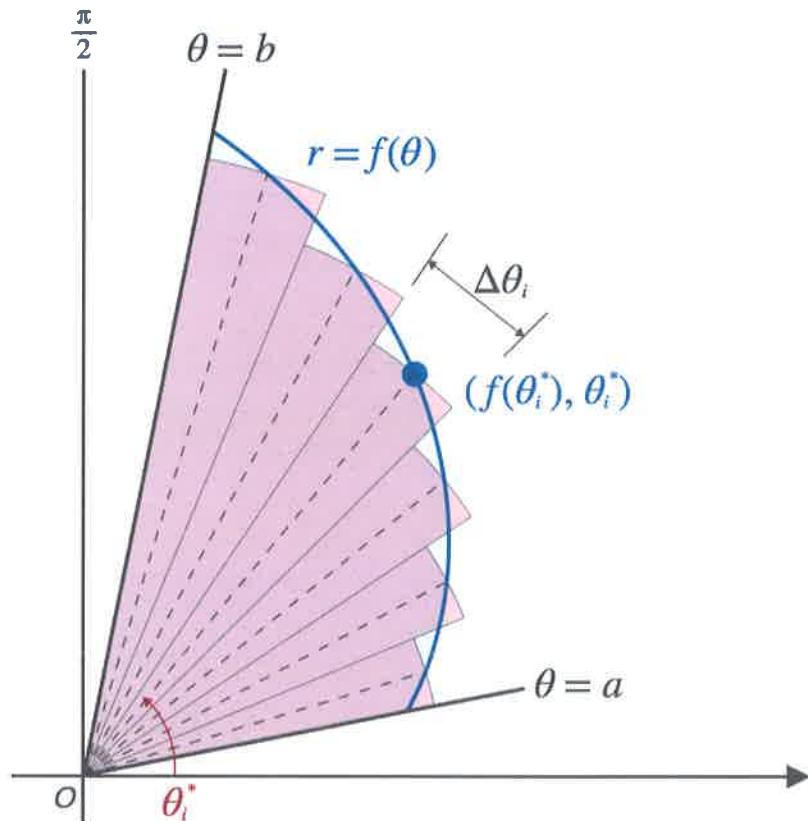


### Area of a Polar Region:



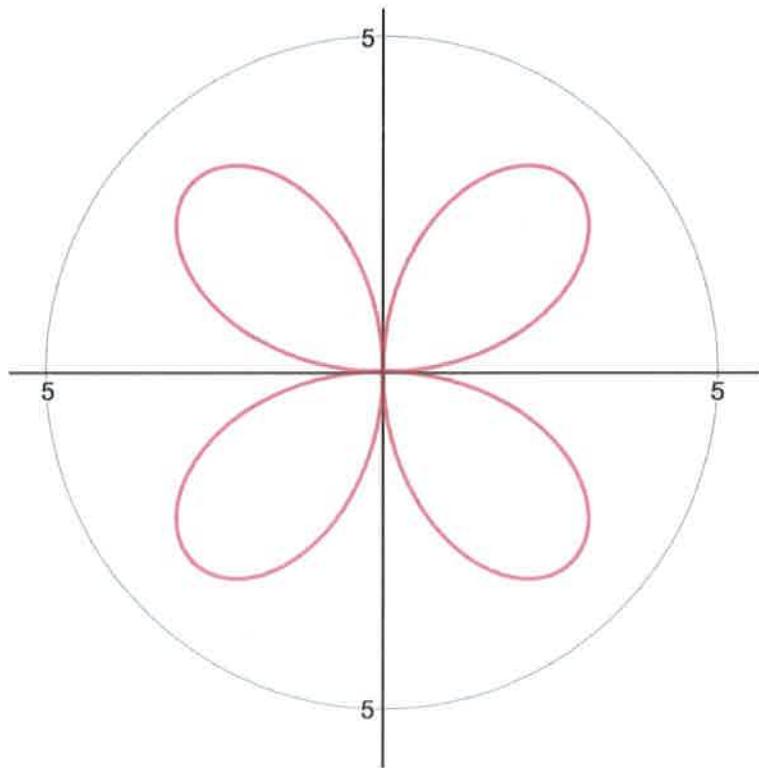
## Formula: Area of a Polar Region

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The area  $A$  of a region bounded between two rays  $\theta = a$  and  $\theta = b$ , where  $0 < b - a \leq 2\pi$ , and by the polar equation  $r = f(\theta)$ , where  $f$  is a continuous positive function, is given by

$$A = \int dA = \int_a^b \frac{1}{2} [f(\theta)]^2 d\theta.$$

Find the area enclosed by the polar curve  $r = 4\sin 2\theta$ .



3-0235 — 50 SHEETS — 5 SQUARES  
3-0236 — 100 SHEETS — 5 SQUARES  
3-0237 — 200 SHEETS — 5 SQUARES  
3-0137 — 200 SHEETS — FILLER

COMET

$$A = \int_a^b \frac{1}{2} [f(\theta)]^2 d\theta$$

$$= 4 \int_0^{\frac{\pi}{2}} \frac{1}{2} [4 \sin 2\theta]^2 d\theta$$

$$= 32 \int_0^{\frac{\pi}{2}} \sin^2 2\theta d\theta$$

$$= 32 \int_0^{\frac{\pi}{2}} \left( \frac{1 - \cos 4\theta}{2} \right) d\theta$$

$$= 32 \left[ \frac{\theta}{2} - \frac{\sin 4\theta}{8} \right]_0^{\frac{\pi}{2}}$$

$$= 32 \left[ \frac{\pi}{4} - \frac{\sin 2\pi}{8} \right] - 0$$

$$= 32 \cdot \frac{\pi}{4} = 8\pi$$