

# Unit 11 - Day 6 - Scavenger Hunt

(A.)

Intersection

$$r = 1 + \cos \theta$$

$$r = 1 - \cos \theta$$

$$1 + \cos \theta = 1 - \cos \theta$$

$$\cos \theta = -\cos \theta$$

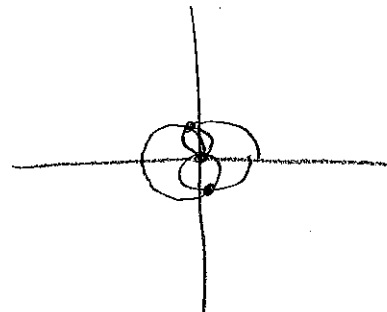
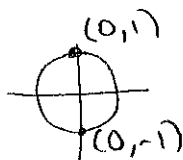
$$2\cos \theta = 0$$

$$\cos \theta = 0$$

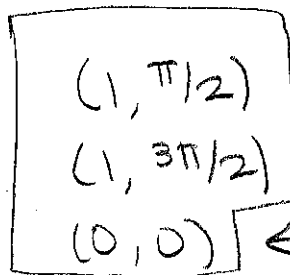
$$\theta = \pi/2, 3\pi/2$$

$$r = 1 + \cos(\pi/2) = 1 + 0 = 1$$

$$r = 1 + \cos(3\pi/2) = 1 + 0 = 1$$



3 points



← at the pole

(H.)

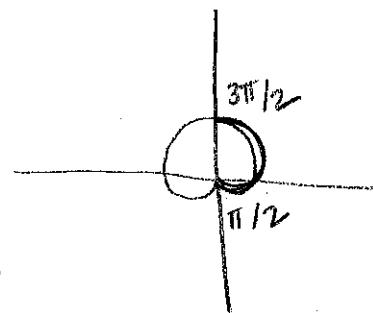
Length

$$r = 1 + \sin \theta$$

$$0 \leq \theta \leq 2\pi$$

$$\int_0^{2\pi} \sqrt{(1 + \sin \theta)^2 + (\cos \theta)^2} d\theta$$

$$= \boxed{8}$$



$$0 \leq \theta < 2\pi$$

(E.)

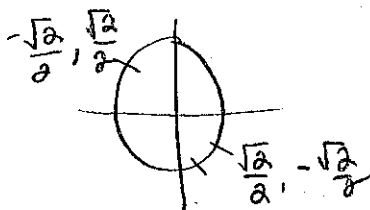
Intersection

$$r = 1 + \cos\theta \quad r = 1 - \sin\theta$$

$$1 + \cos\theta = 1 - \sin\theta$$

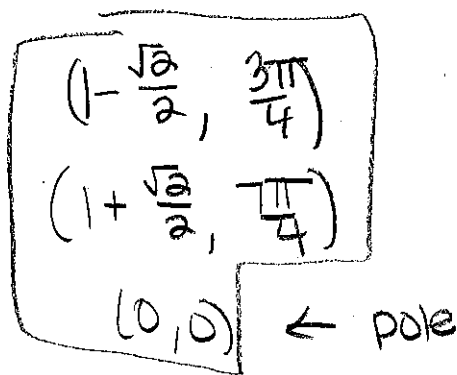
$$\cos\theta = -\sin\theta$$

$$\theta = \frac{3\pi}{4}, \frac{7\pi}{4}$$



$$r = 1 + \cos\left(\frac{3\pi}{4}\right) = 1 + \left(-\frac{\sqrt{2}}{2}\right)$$

$$r = 1 + \cos\left(\frac{7\pi}{4}\right) = 1 + \left(\frac{\sqrt{2}}{2}\right)$$



(B.)

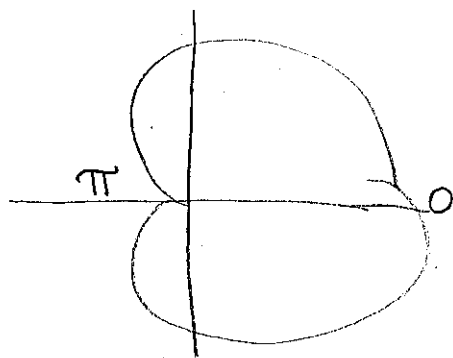
length  $r = 8(1 + \cos\theta)$

$$0 \leq \theta \leq 2\pi$$

$$r = 8 + 8\cos\theta$$

$$\int_0^{2\pi} \sqrt{(8 + 8\cos\theta)^2 + (-8\sin\theta)^2} d\theta$$

$$= \boxed{64}$$



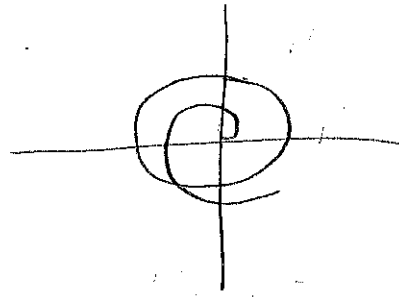
(F.)

Intersection

$$r = \theta/2$$

$$r = 2$$

$$r = \pm 2$$



$$\theta/2 = \pm 2$$

$$\frac{\theta}{2} = \pm 2$$

$$\theta = \pm 4$$

$\theta =$

$$r = \theta/2 = 2$$

$$r = \theta/2 = -2$$

$$(2, 4)$$

$$(2, -4)$$

(C.)

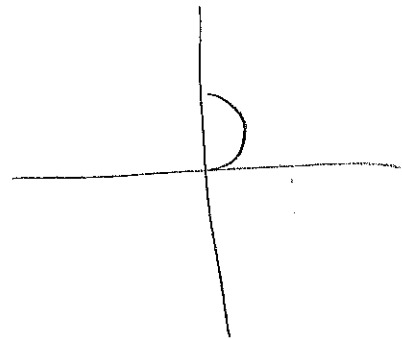
Length

$$r = 2\theta$$

$$0 \leq \theta \leq \pi/2$$

$$\int_0^{\pi/2} \sqrt{(2\theta)^2 + (2)^2} d\theta =$$

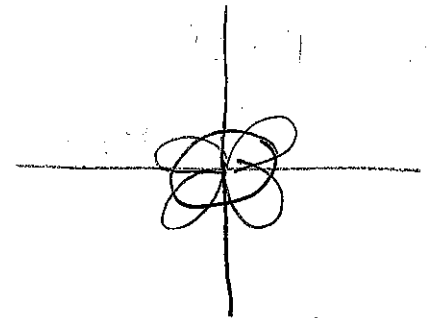
$$4.158$$



(C) Intersection

$$r = 4\sin 2\theta$$

$$r = 2$$
$$r = \pm 2$$



$$4\sin 2\theta = \pm 2$$

$$\sin 2\theta = \pm \frac{1}{2}$$

$$0 \leq \theta < 2\pi$$

$$0 \leq 2\theta < 4\pi$$

2 times  
around unit  
circle

$$2\theta = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}, \frac{19\pi}{6}, \frac{23\pi}{6}$$

$$\theta = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$$

$$(2, \pi/12), (2, 5\pi/12), (2, 7\pi/12), (2, 11\pi/12), (2, 13\pi/12),$$
$$(2, 17\pi/12), (2, 19\pi/12), (2, 23\pi/12)$$

(D) Intersection

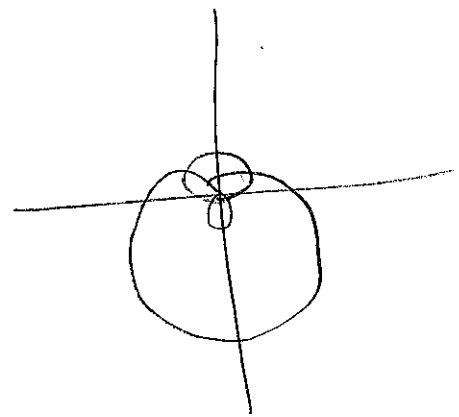
$$r = 4 - 5\sin\theta \quad r = 3\sin\theta$$

$$4 - 5\sin\theta = 3\sin\theta$$

$$4 = 8\sin\theta$$

$$\frac{1}{2} = \sin\theta$$

$$\theta = \pi/6, 5\pi/6$$



$$r = 3\sin(\pi/6) = 3/2$$

$$r = 3\sin(5\pi/6) = 3/2$$

$$(3/2, \pi/6)$$

$$(3/2, 5\pi/6)$$

$$(0, 0)$$