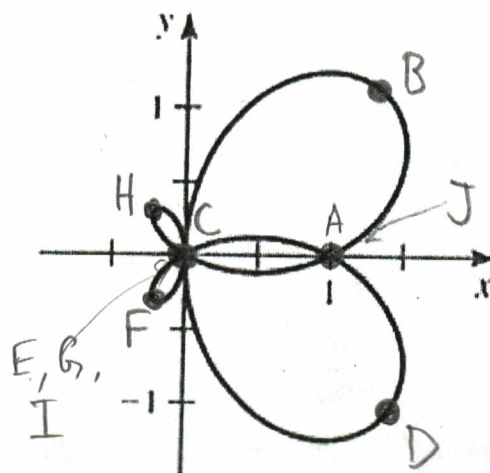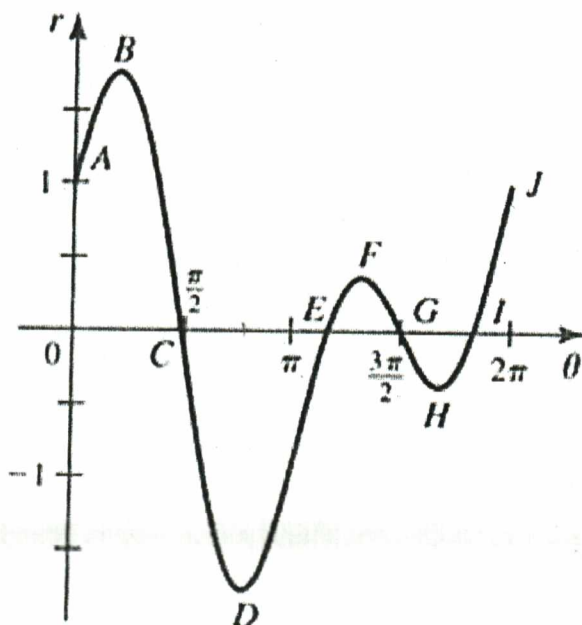# In-Class Quiz 5: Polar coordinates
(§10.1-10.3)

SOLUTIONS

Directions: This quiz is due at the end of lecture.

1. The figure on the left is a Cartesian graph of the polar function

$$r = \cos\theta + \sin 2\theta.$$

The polar graph is on the right. Mark the points on the polar graph that correspond to the points shown on the Cartesian graph.
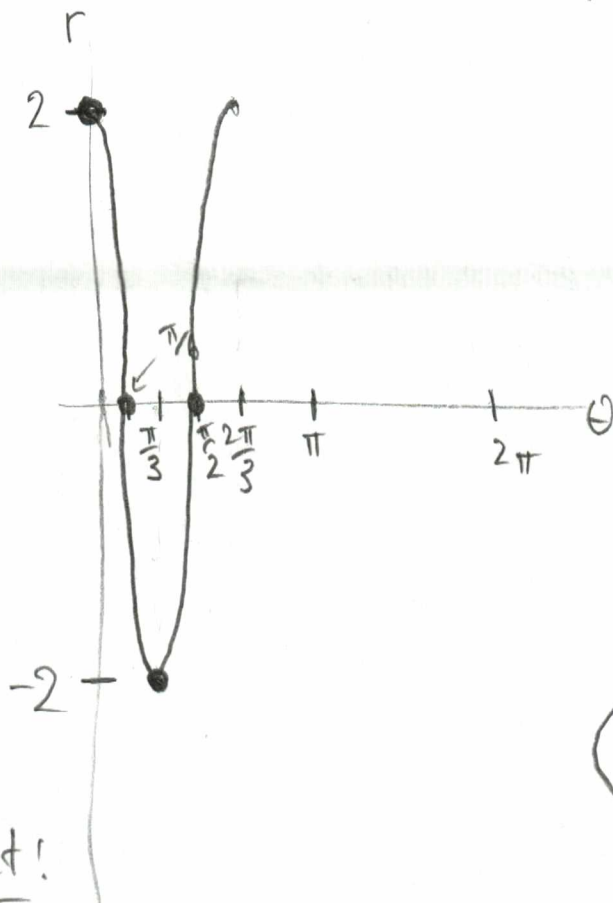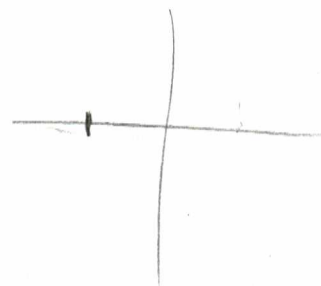
2. The area of the region bounded by a polar graph $r = f(\theta)$ between the angles α and β is given by the formula

$$\frac{1}{2} \int_{\alpha}^{\beta} f(\theta)^2 \, d\theta.$$

$\overset{n}{\underset{\downarrow}{}}$

Graph the rose $r = 2\cos 3\theta$ and then find its area.

$n \text{ odd} \Rightarrow n \text{ petals}$

$n \text{ even} \Rightarrow 2n \text{ petals}$

r

2

$\frac{\pi}{6}$

$\frac{\pi}{3} \quad \frac{\pi}{2} \frac{2\pi}{3} \quad \pi$
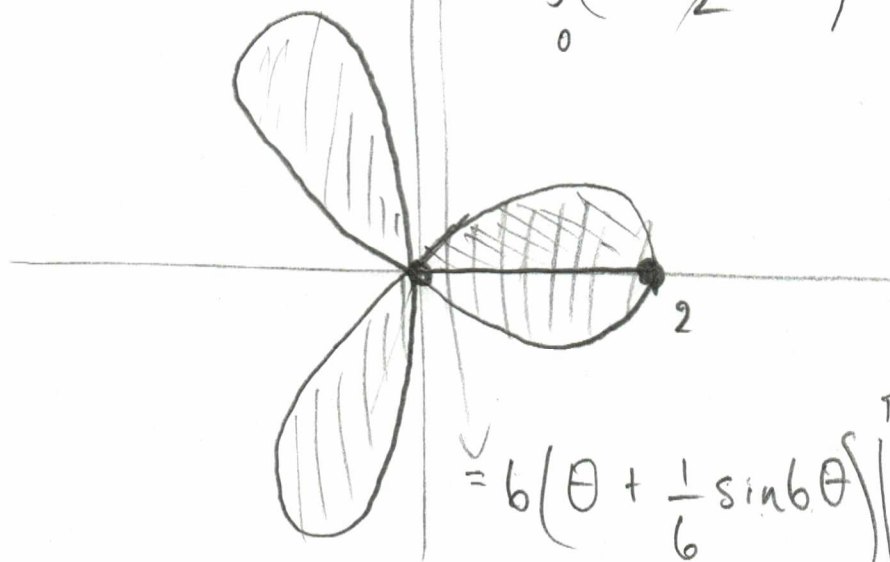
2π

θ

-2

Area:

$6 \cdot \frac{1}{2} \int_0^{\pi/6} (2\cos 3\theta)^2 \, d\theta$

$= 12 \int_0^{\pi/6} \cos^2 3\theta \, d\theta$

$= 12 \int_0^{\pi/6} \left(\frac{1 + \cos 6\theta}{2} \right) d\theta$

Hint!

$\cos^2\theta = \frac{1 + \cos 2\theta}{2}$

2

$= 6 \left(\theta + \frac{1}{6} \sin 6\theta \right) \Big|_0^{\pi/6}$

$= 6 \left(\frac{\pi}{6} + 0 - (0 + 0) \right) = \boxed{\pi}$