

MATH 22 PRACTICE EXAM ON POLAR COORDINATES

Name:

Section:

Instructions:

- (1) Books, notes, and calculators are not permitted.
- (2) Simplify as instructed.
- (3) Show your work as instructed. On some problems, correct answers without justification will not receive full credit.

(1)

(2)

(3)

(4)

(5)

Total

Problem 1. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

The point described by the polar coordinates $(r, \theta) = (-2, \pi)$ has which of the following Cartesian coordinates?

- A. $(2, 0)$.
- B. $(-2, 0)$.
- C. $(0, 2)$.
- D. $(0, -2)$.
- E. None of these.

Problem 2. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

The point whose Cartesian coordinates are $(-\sqrt{3}, 1)$ has which of the following polar coordinates?

- A. $(2, \pi/6)$.
- B. $(2, 5\pi/6)$.
- C. $(5, 2\pi/3)$.
- D. $(6, 5\pi/3)$.
- E. None of these.

Problem 3. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

The area inside the curve $r = 2$ is equal to which of the following?

- A. π .
- B. 2π .
- C. 3π .
- D. 4π .
- E. None of these.

Problem 4. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

The circle $(x - \frac{1}{2})^2 + y^2 = \frac{1}{4}$ has which equation in polar coordinates?

- A. $r = \sin \theta$.
- B. $r = \cos \theta$.
- C. $r = \frac{1}{2} \sin \theta$.
- D. $r = \frac{1}{2} \cos \theta$.
- E. None of these.

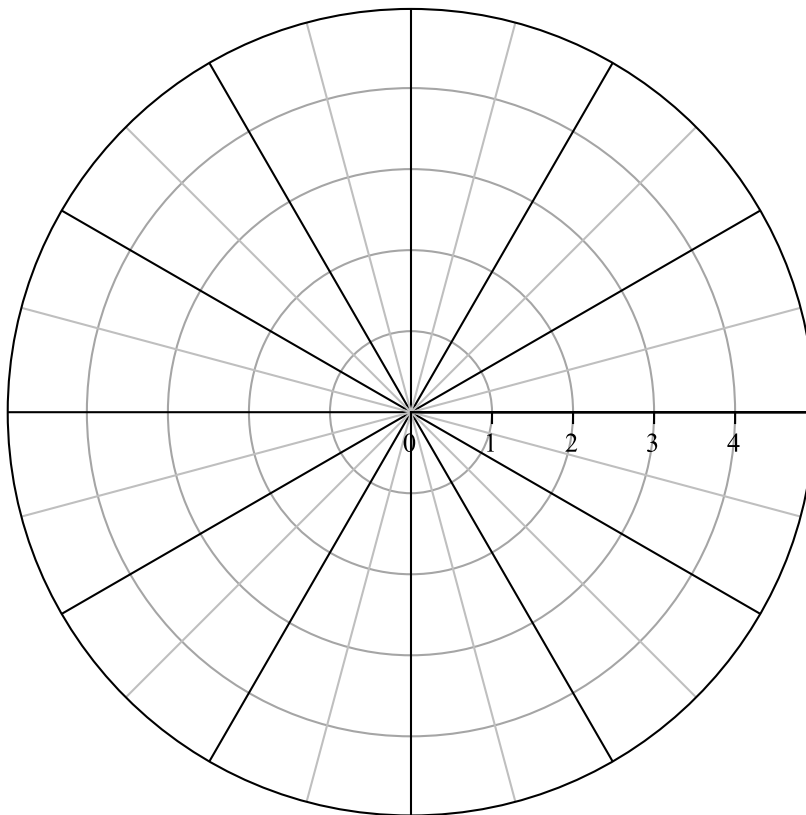
Problem 5. (15 pts.) Consider the polar curve defined by the equation

$$r = 4 \cos(2\theta).$$

Use the polar graph paper below to graph the segment of the curve corresponding to the interval

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

Do **not** graph the entire curve on the interval $0 \leq \theta \leq 2\pi$. You may use the approximations $\sqrt{2} \approx 1.4$, $\sqrt{3} \approx 1.7$. Show your work.



Problem 6. (15 pts.) Find the area of the region inside one leaf of the curve

$$r = 4 \cos(2\theta)$$

and outside of the curve $r = 2$.

Problem 7. (15 pts.) Find the points on the curve $r = 1 + \sin \theta$ where the tangent line is horizontal or vertical.

Problem 8. (15 pts.) Find the slope of the line tangent to the curve

$$r = 3 + \cos(3\theta)$$

at the point where $\theta = \pi/2$.

Problem 9. (15 pts.) Find the equation in rectangular coordinates for the curve given in polar coordinates by

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

You may use the identities $\sin(2\theta) = 2 \sin \theta \cos \theta$ and $\cos(2\theta) = \cos^2 \theta - \sin^2 \theta$.