

Polar Coordinates and Parametric Curves

Grade 12 – Precalculus math · Test · Standards: N-CN.B.4, F-IF.C.7

Name: _____ Date: _____ Class: _____

This 45-minute test has 9 questions worth 20 points. Show every step, give exact values unless told to round, and state polar answers with $r > 0$ unless the question allows otherwise.

Standards: N-CN.B.4, F-IF.C.7 · **Level:** Grade 12 Precalculus

Time: 45 minutes · 9 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Polar to Rectangular (2 points)

Convert $(10, \frac{7\pi}{6})$ to rectangular coordinates. Give exact values.

Question 2 Rectangular to Polar (2 points)

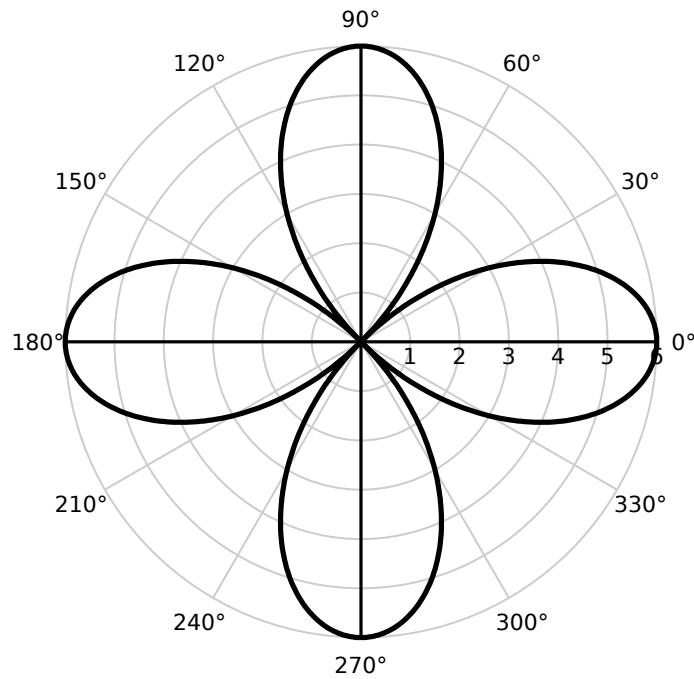
Write $(-2, 2\sqrt{3})$ as (r, θ) with $r > 0$ and $0 \leq \theta < 2\pi$.

Question 3 Converting Equations (2 points)

Convert each polar equation to rectangular form.

- a. $r = -4 \sin \theta$ (1 point)
- b. $r = 6 \sec \theta$ (1 point)

Question 4 Reading a Rose (2 points)



A rose curve.

The figure shows a rose curve of the form $r = a \cos n\theta$.

- State the number of petals and the length of one petal. (1 point)
- Write an equation of a rose with 7 petals, each 2 units long. (1 point)

Question 5 Cardioid Values (2 points)

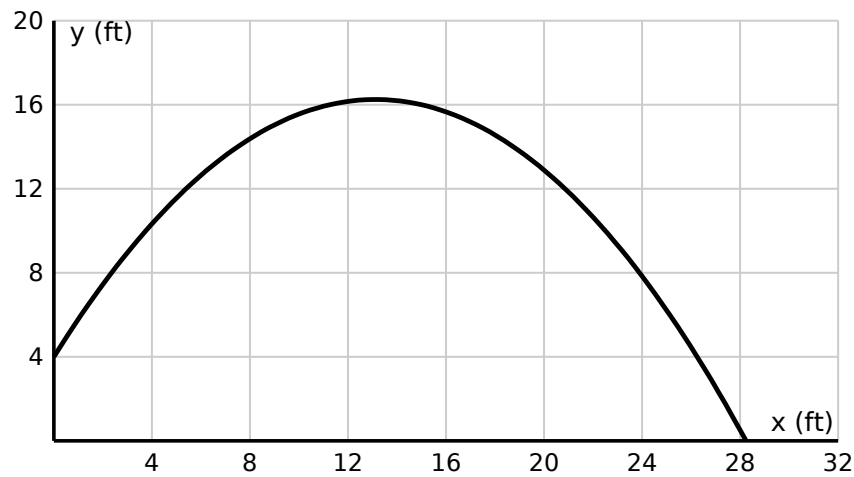
For $r = 2 + 2 \sin \theta$, find r at $\theta = 0, \frac{\pi}{2}, \pi$ and $\frac{3\pi}{2}$. Then state the angle at which the graph touches the pole.

Question 6 Eliminating the Parameter (2 points)

Eliminate the parameter.

- $x = 3t - 2, y = 1 - 2t$ (1 point)
- $x = 1 + 3 \cos t, y = -2 + 3 \sin t$ (1 point)

Question 7 A Thrown Water Balloon (3 points)



Path of a water balloon.

A water balloon follows $x = 15t$ and $y = 4 + 28t - 16t^2$, in feet, t in seconds.

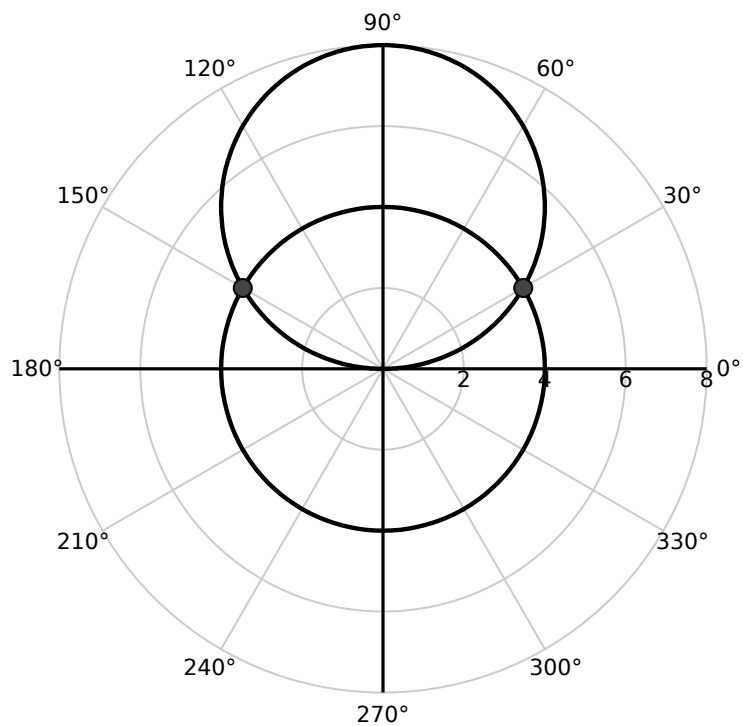
- Find its position at $t = 1$. (1 point)
- Find its maximum height. (1 point)
- Find how far it travels horizontally before it lands, to the nearest tenth of a foot. (1 point)

Question 8 Distance on a Radar Screen (3 points)

A radar shows ship A at polar coordinates (8 mi, 20°) and ship B at (5 mi, 80°).

- Find the angle AOB at the radar O. (1 point)
- Find the distance AB. Give an exact value. (2 points)

Question 9 Intersecting Circles (2 points)



The circles meet at $(4, \pi/6)$ and $(4, 5\pi/6)$.

The figure shows the circles $r = 4$ and $r = 8 \sin \theta$. Find the polar coordinates of both intersection points with $r > 0$ and $0 \leq \theta \leq \pi$.