# PLEASE HURRY A. Plot The Circles X^2+y^2=4 And X^2+y^2=1 On The Same Coordinate Plane. B. Find The Image

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Introduction

Understanding how to plot and analyze circles on the coordinate plane is fundamental in algebra and geometry. In this article, we will explore the process of plotting two specific circles: $X^2 + y^2 = 4$ and $X^2 + y^2 = 1$, on the same coordinate system. Additionally, we will examine how to find the image of these circles, analyze their properties such as radius, center, and their geometric relationship, including points of intersection. Whether you're a student preparing for exams or a math enthusiast seeking clarity, this comprehensive guide will cover everything you need to know.

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Part A: Plotting the Circles $X^2 + y^2 = 4$ and $X^2 + y^2 = 1$

Understanding the Equations

Both equations represent circles centered at the origin (0,0) but with different radii. The general form of a circle's equation centered at the origin is:

\[ x^2 + y^2 = r^2 \]

where:

- Center: at (0, 0)
- Radius: r

For our specific circles:

- Circle 1: $x^2 + y^2 = 4$

- Radius $r_1 = \sqrt{4} = 2$

- Circle 2: $x^2 + y^2 = 1$

- Radius $r_2 = \sqrt{1} = 1$

Step-by-Step Plotting Process

1. Draw the Coordinate Plane

- Draw two perpendicular axes: x-axis (horizontal) and y-axis (vertical).
- Mark units at equal intervals (e.g., 1, 2, 3, etc.) both positive and negative.

2. Plot the First Circle $x^2 + y^2 = 4$

- Since radius $r_1 = 2$, mark points at:
- (2, 0), (-2, 0)
- (0, 2), (0, -2)

- These are points on the circle where the x or y coordinate is zero.

- To complete the circle, plot additional points:

- $(\sqrt{2}, \sqrt{2})$, $(\sqrt{2}, -\sqrt{2})$, $(-\sqrt{2}, \sqrt{2})$, $(-\sqrt{2}, -\sqrt{2})$
- Approximate values: (1.414, 1.414), etc.

- Carefully sketch the circle passing through these points, ensuring smoothness.

3. Plot the Second Circle $x^2 + y^2 = 1$

- Radius $r_2 = 1$:
- Mark points at:
- (1, 0), (-1, 0)
- (0, 1), (0, -1)
- Additional points:
- $(\sqrt{0.5}, \sqrt{0.5})$, approximately (0.707, 0.707), etc.

- Sketch the smaller circle passing through these points.

4. Label the Circles

- Clearly indicate which circle is larger (radius 2) and which is smaller (radius 1).
- Mark the centers at (0,0).

Visual Summary

- The larger circle (radius 2) encloses the smaller circle (radius 1).
- Both are centered at the origin, meaning they are concentric.

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Part B: Finding The Image of the Circles

Once the circles are plotted, analyzing their images involves understanding their geometric properties, intersections, and what these figures represent.

1. Properties of the Circles

| Property | Circle $x^2 + y^2 = 4$ | Circle $x^2 + y^2 = 1$ |
|---|---|---|
| Center | (0, 0) | (0, 0) |
| Radius | 2 | 1 |
| Diameter | 4 | 2 |
| Circumference | $2\pi r = 4\pi$ | $2\pi r = 2\pi$ |
| Area | $\pi r^2 = 4\pi$ | $\pi r^2 = \pi$ |

- Both circles are concentric, sharing the same center at the origin.
- The larger circle contains the smaller entirely, with no intersection points.

2. Intersection Points

Since both circles are concentric, they do not intersect unless they are the same circle (which they are not).

- Equation for intersection: To find if they intersect, set their equations equal:

$$x^2 + y^2 = 4$$
$$x^2 + y^2 = 1$$

- Since both equal $x^2 + y^2$, they are only equal when:

$$4 = 1$$ (which is false)

- Therefore, no intersection points exist. The circles are disjoint.

3. Geometric Implication

- The smaller circle lies entirely within the larger circle.
- The space between the two circles is an annular region (ring-shaped area).

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Visual and Geometric Significance

Understanding the "image" of these circles involves recognizing their position relative to each other:

- The large circle (radius 2) acts as a boundary, encompassing all points where $x^2 + y^2 \leq 4$.
- The small circle (radius 1) is entirely within the larger, with all points satisfying $x^2 + y^2 \leq 1$.
- These circles are often used in problems involving:

- Area calculations of rings (annuli)
- Distance-based questions, such as points lying between the two circles
- Optical or signal boundary modeling in physics

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Advanced Analyses and Applications

1. Area of the Annular Region

- The area between the two circles (the ring) is:

$$
A = \text{Area of larger circle} - \text{Area of smaller circle} = 4\pi - \pi = 3\pi
$$

2. Coordinate Geometry Applications

- The concentric circles can be used to solve problems involving distances from the origin.
- For example, points satisfying $1 \leq x^2 + y^2 \leq 4$ lie between these two circles.

3. Real-World Contexts

- Modeling zones of influence or coverage areas, like radio towers or sensors.
- Visualizing the range of certain phenomena concentrated around a central point.

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Summary and Key Takeaways

- Plotting the Circles:
- Both are centered at the origin, with radii 2 and 1.
- Use key points at (±r, 0) and (0, ±r) to help draw accurate circles.
- Understanding Their Image:
- The larger circle encompasses the smaller.
- No intersection points exist because they are concentric and have different radii.
- The area of the ring (annulus) between them is $3\pi$.
- Applications:
- Useful in geometric proofs, physics, engineering, and problem-solving involving concentric zones.

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Final Tips for Students and Enthusiasts

- Always identify the center and radius from the standard form equations.
- Use symmetry to simplify plotting: points at (r, 0), (0, r), and their negatives are enough to sketch.
- Remember that concentric circles share the same center but have different radii, leading to specific

properties like no intersection points.

- Practice plotting these circles on graph paper or using digital graphing tools for better accuracy.
- Apply these concepts to more complex problems involving multiple circles, tangents, and intersections.

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Conclusion

Plotting and analyzing circles like $x^2 + y^2 = 4$ and $x^2 + y^2 = 1$ deepen your understanding of their geometric properties and relationships. Recognizing their concentric nature, calculating areas, and visualizing their images are crucial skills in geometry. Armed with these insights, you can confidently approach similar problems and extend your knowledge to more advanced topics in mathematics.

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Feel free to explore further by experimenting with different circle equations, their intersections, and applications in real-world scenarios!

# Frequently Asked Questions

## How do you plot the circles given by the equations $x^2 + y^2 = 4$ and $x^2 + y^2 = 1$ on the same coordinate plane?

To plot these circles, identify their centers and radii. Both equations are in the form $x^2 + y^2 = r^2$, so their centers are at the origin (0,0). The first circle has radius 2, and the second has radius 1. Draw two circles centered at (0,0) with these radii to visualize them on the same coordinate plane.

## What is the significance of the equations $x^2 + y^2 = 4$ and $x^2 + y^2 = 1$ in the context of circle graphs?

These equations represent circles centered at the origin with radii 2 and 1, respectively. They are examples of standard form circles, with the radius directly related to the constant on the right side of the equation, demonstrating how the equation defines the size of the circle.

## How can I find the image of the circles after transformations such as translations or dilations?

To find the image of the circles after transformations, apply the transformation rules to the circle's equation or its center and radius. For example, translations shift the center, while dilations change the radius proportionally. The new equations will reflect these changes accordingly.

## What does the 'find the image' part refer to in the context of these circle equations?

'Find the image' refers to determining the resulting position and size of the circles after applying a transformation (like translation, dilation, or reflection). It involves calculating the new equations or coordinates representing the transformed circles.

## Are the two circles $x^2 + y^2 = 4$ and $x^2 + y^2 = 1$ intersecting? How can I determine this?

Since both circles are centered at the origin with radii 2 and 1, and the larger one has radius 2, the smaller radius is 1, and the centers coincide at (0,0). They do not intersect because one is completely inside the other, touching only at the origin if the equations are equal at that point. Specifically, they are concentric circles with different radii, so they do not intersect except at the origin if the smaller circle is included within the larger.

### Can these circles be tangent to each other? Why or why not?

No, these circles are concentric with different radii, so they cannot be tangent to each other. Tangency requires the circles to touch at exactly one point, but since they share the same center and have different radii, they are either one inside the other or separate, not tangent.

## Additional Resources

Plotting the Circles $x^{2} + y^{2} = 4$ and $x^{2} + y^{2} = 1$ on the Same Coordinate Plane: A Comprehensive Guide

Plotting geometric figures such as circles on the same coordinate plane is a fundamental skill in algebra and analytic geometry. It helps visualize relationships between different shapes, understand their positions relative to each other, and analyze their features more intuitively. In this article, we will explore how to plot the circles defined by the equations $x^{2} + y^{2} = 4$ and $x^{2} + y^{2} = 1$, and then find their images under various transformations. This comprehensive guide aims to clarify the process, discuss features, and elucidate the mathematical insights involved.

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## Understanding the Equations of the Circles

Before diving into plotting, it's essential to understand what these equations represent and how their parameters influence their shapes.

### Standard Form of a Circle Equation

The general equation of a circle centered at $(h, k)$ with radius $r$ is:

$$
(x - h)^2 + (y - k)^2 = r^2
$$

In our case, both equations are centered at the origin $(0,0)$, simplifying to:

- $x^2 + y^2 = 4$
- $x^2 + y^2 = 1$

Here, the radii are:

- $r_1 = \sqrt{4} = 2$
- $r_2 = \sqrt{1} = 1$

This indicates that the first circle has a radius of 2, and the second has a radius of 1, both centered at the origin.

### Visual Significance of the Equations

- The circle $x^{2} + y^{2} = 4$ is a larger circle encompassing the origin with radius 2.
- The circle $x^{2} + y^{2} = 1$ is a smaller circle, also centered at the origin, with radius 1.

Both are concentric, meaning they share the same center, which simplifies their plotting and analysis.

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## Plotting the Circles on the Coordinate Plane

Plotting these circles involves understanding their size, position, and how they relate to each other.

## Step-by-Step Plotting Process

1. Draw the Coordinate Axes: Start with a standard XY-plane, marking axes with appropriate scales.

2. Identify the Center: Since both circles are centered at $(0,0)$, plot this point as the origin.

3. Draw the Larger Circle $\boldsymbol{x^{2} + y^{2} = 4}$:

- Use a compass set to radius 2 units.
- From the origin, draw a circle passing through points $(2,0)$, $(-2,0)$, $(0,2)$, and $(0,-2)$.
- These points are key because they correspond to the intersections with the axes.

4. Draw the Smaller Circle $\boldsymbol{x^{2} + y^{2} = 1}$:

- Use a compass set to radius 1 unit.
- From the origin, draw a smaller circle passing through $(1,0)$, $(-1,0)$, $(0,1)$, and $(0,-1)$.

5. Label the Circles:

- Clearly mark the larger circle as $x^2 + y^2 = 4$.
- Mark the smaller circle as $x^2 + y^2 = 1$.

## Features and Observations

- Concentricity: Both circles share the same center at the origin.
- Size Difference: The larger circle has a radius twice that of the smaller.
- Symmetry: Both are symmetric about the axes and the origin.
- Area:
- Larger circle: $\pi r^2 = \pi \times 4 = 4\pi$.
- Smaller circle: $\pi r^2 = \pi \times 1 = \pi$.

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# Finding the Image of the Circles Under Transformations

Transformations such as translations, dilations, and reflections alter the position and size of these circles. To explore their images, we must understand how specific transformations affect the equations.

## Common Transformations and Their Effects

- Translation: Moves the circle without changing its size.
- Scaling (Dilation): Changes the size proportionally.
- Reflection: Flips the circle over a line (e.g., x-axis or y-axis).
- Rotation: Rotates the circle around a point, typically the origin.

Since our original circles are centered at the origin, transformations involving translation will shift their centers, while scaling will alter their radii.

## Example: Find the Image of the Circles Under a Translation

Suppose we translate both circles by $(h, k)$—say, $(3, 2)$:

- New Center: $(h, k) = (3, 2)$.
- Transformed Equations:
- Original $x^{2} + y^{2} = r^{2}$.
- After translation, the equations become:

$$
(x - 3)^2 + (y - 2)^2 = r^{2}
$$

- New Circles:
- $(x - 3)^2 + (y - 2)^2 = 4$ (radius 2, center at $(3, 2)$)
- $(x - 3)^2 + (y - 2)^2 = 1$ (radius 1, center at $(3, 2)$)

This shifts both circles to the new center $(3, 2)$, maintaining their sizes.

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# Analyzing the Intersection and Relationships of the Circles

Understanding the relative positions of the circles enhances comprehension of their geometric properties.

## Are the Circles Intersecting?

- Since both are concentric, they do not intersect unless one circle is inside the other.
- The smaller circle lies entirely within the larger one because its radius (1) is less than the larger circle's radius (2).

## Enclosed and External Regions

- The smaller circle is entirely enclosed within the larger circle.
- The difference in their radii determines the annular region between them, which is of interest in many applications.

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## Summary of Features and Applications

Features of Plotting and Analyzing the Circles:

- Visualization: Plotting helps in understanding the spatial relationships.
- Mathematical Properties: Radii, centers, areas, and symmetry are straightforward from equations.
- Transformations: Enable exploration of how geometric figures behave under different mappings.

Applications:

- Design of circular objects in engineering.
- Analyzing regions in calculus.
- Understanding concentric and tangent circles in geometry.

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## Conclusion: The Significance of Plotting and Transformation in Geometry

Plotting the circles $x^{2} + y^{2} = 4$ and $x^{2} + y^{2} = 1$ on the same coordinate plane provides a clear visualization of their sizes, positions, and relationships. Recognizing their concentric nature simplifies the process, allowing for easy plotting with basic tools like compasses and rulers. Furthermore, understanding how these circles transform under various mappings illuminates their behavior and applications in broader mathematical contexts. Whether analyzing their intersection points, studying their images under transformations, or applying this knowledge in real-world scenarios, mastering these concepts enhances spatial reasoning and geometric intuition.

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Pros of Plotting and Analyzing Circles:

- Enhances visualization skills.
- Facilitates understanding of geometric relationships.
- Critical for solving complex problems involving circles.
- Aids in comprehension of transformations and their effects.

Cons or Challenges:

- Accurate plotting requires precision.
- Complex transformations can involve intricate calculations.
- Visual ambiguities may arise without proper scaling and tools.

Overall, mastering the plotting of circles and understanding their images under transformations is a fundamental, yet powerful, aspect of analytic geometry, opening doors to more advanced mathematical concepts and real-world applications.

## [Please Hurry A Plot The Circles X 2 Y 2 4 And X 2 Y 2 1 On The Same Coordinate Plane B Find The Image]

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