1. Which of the following is correct about the equation of a circle centered at the origin? (Math 1st paper by SU Ahmed | Page: 105 | FIG. 4.1 )
2. x2 + y2 = r2 (ans.)
3. x2 + y2 = r
4. = r2
5. x2 - y2 + r2 = 0

Prove: Suppose that the center of the circle is O (0, 0) and P (x, y) on the circumference is any one point and radius OP = r

Then, OP2 = r2

or, (x – 0)2 + (y – 0)2 = r2

Or, x2 + y2 = r2 which is the equation of the circle centered at the origin.

1. Which of the following is the equation of a circle with specific center and radius? (Page: 105 | FIG. 4.3)
2. (x – h)2 + (y – k)2 = r2 (ans.)
3. x2  + y2 + 2gx + 2fy + c = 0
4. r =
5. (x – g)2 + (y – f)2 = r2

Prove: Suppose the center of a circle (h, k), radius = r and any point P (x, y) on the circumference.

By definition we get CP = r or, CP2 = r2

Or, (x - h)2 + (y - k)2 = r2 which is the equation of a circle with specific center and radius.

1. What is the general equation of a circle?
2. x2  + y2 + 2gx + 2fy + c = 0 (ans.)
3. (x – g)2 + (y – f)2 = r2
4. x2  + y2 + 2gx + 2fy - c = 0
5. (x – x1)2 + (y – y1)2 = r2

Prove: We know that the equation of a circle with radius of center (h, k) and r,

(x - h)2 + (y - k)2 = r2 or, x2 + y2 - 2hx -2ky + (h2 + k2 – r2) = 0

Now, we get h = -g, k = -f and h2 + k2 - r2 = c,

x2 + y2 + 2gx + 2fy + c = 0, which is the general equation of the circle.

1. If the center of the circle is (-g, -f) then what is the general equation of radius of the circle?
2. r = (ans.)
3. r = (x – g)2 + (y – f)2
4. r =
5. r = 2

Prove: h = -g, k = -f. Therefore the center of the circle is (h, k) or, (-g, -f) and

h2 + k2 - r2 = c

Or, g2 + f2 - c = r2

Or, r = , which is the general equation of the radius of the circle.

1. Assuming the points (x1, y1) and (x1, y2) at the vertex of the diameter, which is the equation of the circle? (Page: 107 | FIG: 4.3.3)
2. (x – x1) (x– x2) + (y – y1) (y – y2) = 0 (ans.)
3. (x – x1) (x1 – x2) + (y – y1) (y1 ­– y2) = 0
4. = 0
5. (x + x1) (x+ x2) - (y + y1) (y + y2) = 0

Prove: Suppose the two ends of the diameter of a circle are A (x1, y1) and B (x2, y2) and P (x, y) is any moving point on the circumference. The slops of AP and BP are, respectively and .

Since, the semicircle is ∠APB = 90, so AP ⊥ BP.

Therefore, × = -1

or, (y – y1) (y – y2) = - (x – x1) (x – x2)

Therefore, (x – x1) (x– x2) + (y – y1) (y – y2) = 0, which is the equation of the determinable circle.\

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Prove: x2 + y2 + 2gx + 2fy + c = 0 … …(i)

If the circle intersects the x-axis, the crore y = 0 of the point of intersection.

So by putting y = 0 in the given equation (i) we get,

x2 + 2gx + c = 0, which is a quadratic equation of x.

Assume that the roots are x1, x2 = -2g and x1x2 = c

So,

7.

8. If the circle touches the x-axis - (Page: 107 | FIG: 4.3.4.)

1. g2 = c (ans.)
2. f2 = c
3. 2 = 0
4. g = r2

Prove: If the circle touches the x-axis, then the fraction of the x-axis, 2 ,

Therefore, g2 = c

9. If the circle touches the y-axis – (Page: 107 | FIG: 4.3.4.)

1. f2 = c (ans.)
2. g2 = c
3. 2 = 0
4. f = r2

Prove: If the circle touches the y-axis, then the fraction of the y-axis, 2 ,

Therefore, f2 = c

10. Which is the polar equation of the x2 + y2 = c2 circle?

1. r = c (ans.)
2. c2 = r
3. r2 = c
4. r cosθ = r sinθ

Prove: If the center of the circle is the origin and the radius is c, then the Cartesian equation of the circle is x2 + y2 = c2. The Cartesian equation of this circle is x2 + y2 = c2…… (i)

By putting x = r cosθ , y = r sinθ in equation (i) we get,

r2 (cos2θ + sin2θ) = c2

or, r2 = c2

Therefore, r = c, which is the polar equation of the circle x2 + y2 = c2.

11. Which is the equation of the tangent to the circle? (Page: 115 | FIG : 4.5)

1. y = mx ± r (ans.)
2. y = mx ± r
3. y = mx + c
4. mx ± + c

12. Which is the equation of the transit point of intersection of x2 + y2 = r2 circle?

1. x2 + y2 = 2r2 (ans.)
2. r2 = c2
3. x2 - y2 = r2
4. (x – h)2 + (y – k)2 = r2

Prove: We know the equation of tangents drawn in x2 + y2 = r2 circle,

y = mx + r , when m = the slope of the tangent

or, (y – mx)2 = r2 (1 + m2)

or, (x2 – r2)m2 – 2xym + (y2 – r2) = 0

which is a quadratic equation of m. Suppose, the original two m1, m2. So if two tangents intersect vertically, m1 × m2 = -1

or, = -1

Since, αβ = c / a.

or, y2 – r2 = -x2 + r2

or, x2 + y2 = 2r2