TURBO

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Circles

Class 11 Mathematics • Complete Formula Sheet

Sr.	Concept	Formulas	Other Information
1	General Equation of a Circle	**Standard form:** $(x-h)^2+(y-k)^2=r^2$	Center: (h,k) Radius: r
2	Equation of Circle (Origin as Center)	$x^2+y^2=r^2$	Center at origin: $(0,0)$ Radius: r
3	General Form of a Circle	$x^2+y^2+2gx+2fy+c=0$	Center: $(-g,-f)$ Radius: $\sqrt{g^2+f^2-c}$
4	Diameter Form of a Circle	If $A(x_1,y_1)$ and $B(x_2,y_2)$ are ends of a diameter: $(x-x_1)(x-x_2)+(y-y_1)(y-y_2)=0$	This form directly uses the endpoints of diameter to form circle equation
5	Parametric Coordinates on a Circle	For circle centered at origin with radius r: Point on circle: $(r\cos\theta, r\sin\theta)$	θ is the parameter (angle) Any point on circle can be represented using this form
6	Length of Tangent	From point $P(x_1,y_1)$ to circle $x^2+y^2+2gx+2fy+c=0$: Length $=\sqrt{x_1^2+y_1^2+2gx_1+2fy_1+c}$	This gives distance from external point to point of tangency
7	Equation of Tangent to a Circle	**Point form** (point (x_1,y_1) on circle): For circle $x^2+y^2=r^2$: $xx_1+yy_1=r^2$ **General form** (circle $x^2+y^2+2gx+2fy+c=0$): $T=0 \to xx_1+yy_1+g(x+x_1)+f(y+y_1)+c=0$	Replace x^2 by xx_1, y^2 by yy_1, $2gx$ by $g(x+x_1)$, $2fy$ by $f(y+y_1)$
8	Condition for Line to be Tangent	For line $y=mx+c$ and circle $x^2+y^2=r^2$: **Condition:** Distance from center to line = radius $\Rightarrow \frac{\lvert c\rvert}{\sqrt{1+m^2}}=r$ Or: $c^2=r^2(1+m^2)$	Tangent line touches circle at exactly one point
9	Equation of Normal to a Circle	Normal at point (x_1,y_1) on circle: **Equation:** Line joining center and (x_1,y_1) If center is (h,k): $\frac{y-y_1}{x-x_1}=\frac{y_1-k}{x_1-h}$	Normal passes through center of circle Normal is perpendicular to tangent at point of contact
10	Intersection of Line and Circle	Substitute linear equation into circle equation Solve resulting quadratic in x or y **Discriminant** $D>0$: two points of intersection $D=0$: line is tangent $D<0$: no real intersection	Number of intersection points determined by discriminant
11	Power of a Point	**Power** = (Distance from center)$^2-r^2$ For point $P(x_1,y_1)$ and circle $x^2+y^2+2gx+2fy+c=0$: Power $=x_1^2+y_1^2+2gx_1+2fy_1+c$	If point is: - Outside circle: Power >0 - On circle: Power $=0$ - Inside circle: Power <0