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Polar Coordinates Guided Notes

Polar Coordinates

Polar Coordinates are a pair of coordinates locating the position of point in a plane, with the first coordinate being the length of the straight line (r) connecting to the point from the origin and second the angle (θ) made by this line with a fixed line.

Mathematically:

Polar coordinates are represented as $P(r, \theta)$.

Re-writing same Polar Coordinates

Polar coordinates can be re-written by adding or subtracting a certain angle from the given angle. Depending on the angle, the sign with radius changes between positive and negative.

Mathematically,

If there is a polar coordinate $P(r, \theta)$, then similar coordinates can be written by adding(or subtracting) $k\pi(k180°)$ to the given angle.

- If $\boldsymbol{k}$ is even, then the sign of $\boldsymbol{r}$ remains positive.
- If $\boldsymbol{k}$ is odd, then the sign of $\boldsymbol{r}$ becomes negative.

Problem 1: Find a different pair of polar coordinates for the point $(5, 960°)$ such that $0 \leq \theta \leq 180°$ or $0 \leq \theta \leq \pi$.

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Distance Formula for Polar Coordinates

If we have two polar coordinates $P_1(r_1, \theta_1)$ and $P_2(r_2, \theta_2)$, the distance between the two points (represented as P_1P_2) is given by:

$$\text{Distance } \boldsymbol{P_1P_2} = \sqrt{\boldsymbol{r_1}^2 + \boldsymbol{r_2}^2 - 2\boldsymbol{r_1 r_2}\cos(\boldsymbol{\theta_2 - \theta_1})}$$

Problem 2: Find the distance between the points $(2, 30°)$ and $(5, 120°)$.