Cycloids

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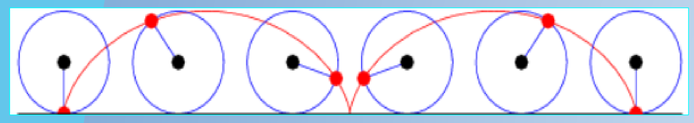
Definition

A cycloid is the curve traced by a point on the edge of a circle as it rotates along a straight line without slip.



History

Discovered in 1599 by Galileo, the cycloid has found its way into many applications since then. It was used by many mathematicians such as Roberval, Wren, Huygens, and Bernoulli to attempt to find the area by weighing pieces of metal cut into the shape of a cycloid, designs for early gear teeth technologies, and was the key part of solving Bernoulli's Brachistochrone problem.

Faculty Mentor: Adam Christopherson

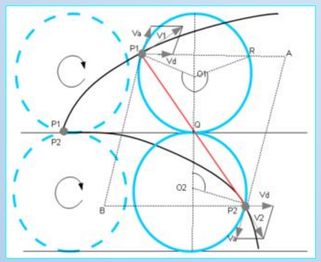
Equations

$$x = rt - rsin(t) \qquad y = r - rcos(t)$$

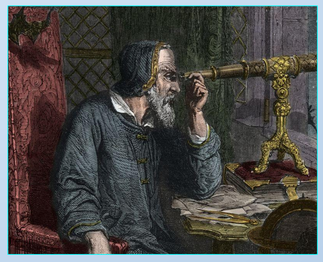
$$x = r\arccos\left(\frac{r-y}{r}\right) - \sqrt{2ry - y^2}$$

$$Arc\ length = 8r\ for\ one\ period$$

$$Area\ under\ cycloid = 3\pi r^2$$



The involute properties of the Cycloid. Demonstration of how the involute of Cycloid is same as Cycloid.



Discovered By Galileo in 1599

Related Curves

- Cycloidal Pendulum
- Trochoid
- Hypotrochoid
- Epitrochoid
- Hypocycloid
- Epicycloid

Applications

- Rotary Pumps
- Design of the gear tooth profiles.
- Kinematics
- Mechanical Transmissions
- Thermal Engines
- Architecture
- Pendulum Clock

References

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