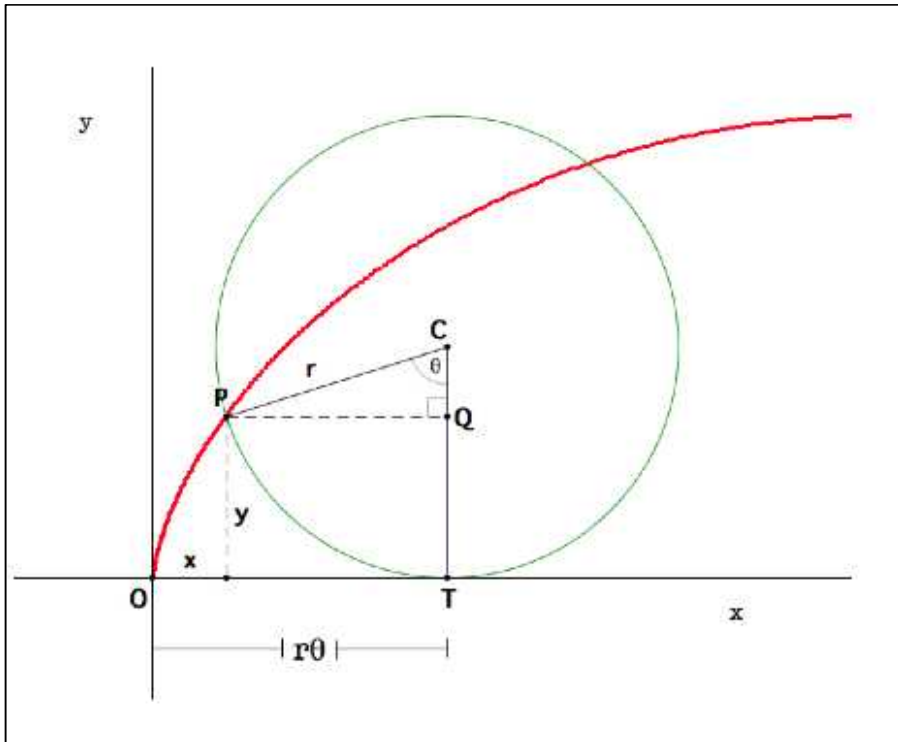


Cycloid Curve Definition



Cycloid

A Cycloid is the curve traced by a point on the rim of a circular wheel as the wheel rolls along a straight line.

Equation definitions

$$\blacklozenge \quad x (|PQ|) = r*(t-\sin(t))$$

$$\blacklozenge \quad y (|TC|) = r*(1-\cos(t))$$

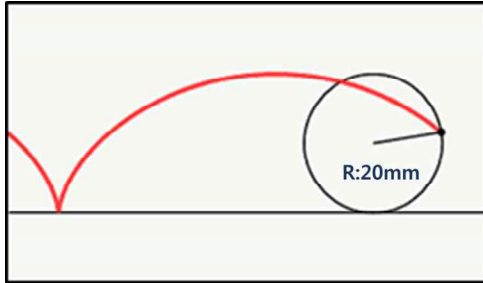
* r : circular wheel radius.

* t : angle ($0 \leq \theta \leq 2\pi*n$) radian.

Ref [Cycloid Curve Equation]

<http://www.digi-area.com/DifferentialGeometryLibrary/PlaneCurves/Cycloid.php>

Ex1. Draw Cycloid Curve R:20mm, $t(0 \leq \theta \leq 2\pi)$



Math Equation definitions

- ◆ $x = 20 * (t - \sin(t))$
- ◆ $y = 20 * (1 - \cos(t))$

Equation definitions for draw in NX

- ◆ $xt = 20 * ((t * 360) / 180 * \pi()) - \sin(t * 360)$
- ◆ $yt = 20 * (1 - \cos(t * 360)) / t = 0$
- ◆ $zt = 0$

Using Law Curve Function in NX 1. Function define using expressions

Expressions			
Listed Expressions			
Named			
Name	Formula	Value	Units
t (Law Defined Spline(11) law_func_para...	0	0	mm
xt (Law Defined Spline(11) law_func_equ...	$20 * ((t * 360) / 180 * \pi()) - \sin(t * 360)$	0	mm
yt (Law Defined Spline(11) law_func_equ...	$20 * (1 - \cos(t * 360))$	0	mm
zt (Law Defined Spline(11) law_func_equ...	0	0	mm

Ex1. Draw Cycloid Curve R:20mm, t($0 \leq \theta \leq 2\pi$)

2. Create Cycloid Curve by law curve.

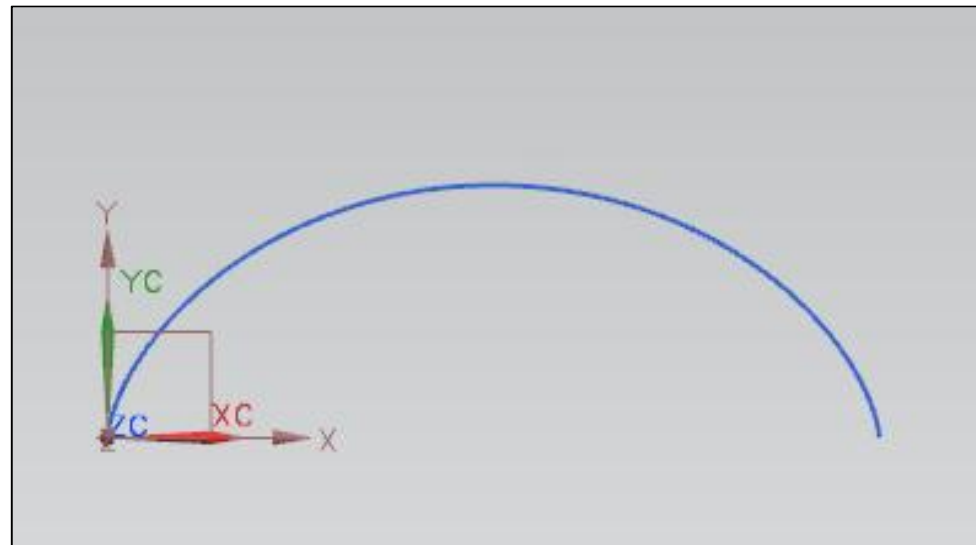
X law : by equation , Y law: by equation , Z law: by equation.

X Law	
Law Type	By Equation
Parameter	t
Function	xt

Y Law	
Law Type	By Equation
Parameter	t
Function	yt

Z Law	
Law Type	By Equation
Parameter	t
Function	zt

- t: law_function_parameter / Xt: law function of axis x
- Yt : law function of axis y / Zt: law function of axis z



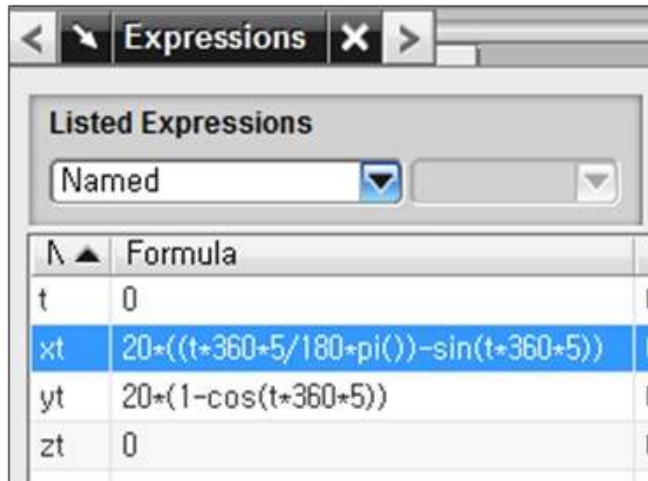
Ex1. Draw Cycloid Curve R:20mm, t($0 \leq \theta \leq 2\pi$)

3. Result analysis



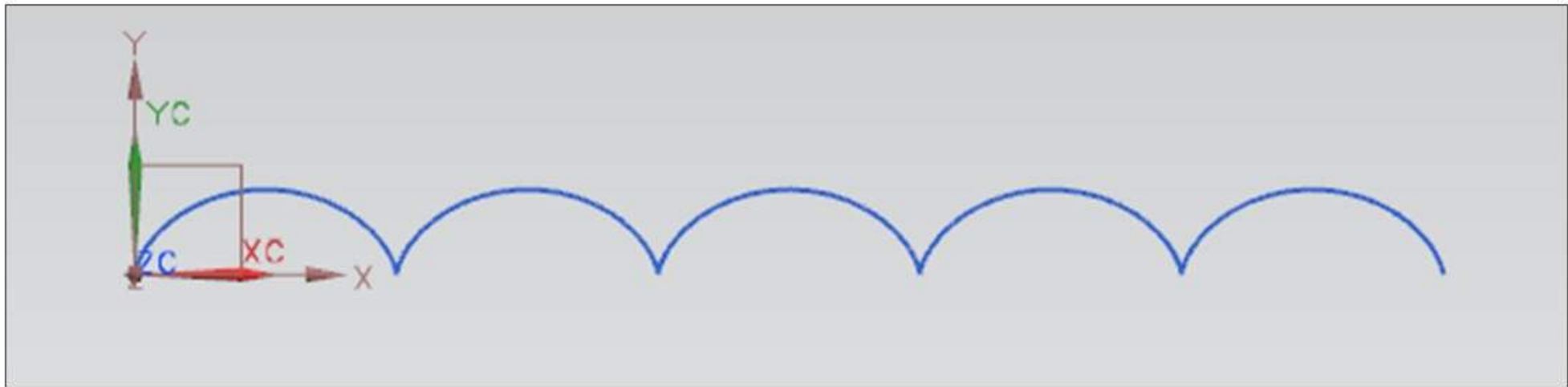
- * Grid Spacing :5mm
- * Max high: $5 \times 8 = 40\text{mm}$
- * 40mm is circular wheel diameter.

Ex2. Draw Cycloid Curve R:20mm, t($0 \leq \theta \leq 2\pi \cdot n$)

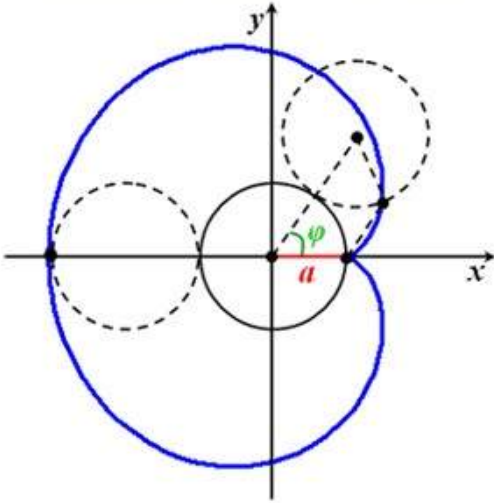


Equation definitions for draw in NX

- ◆ $xt = 20 \cdot ((t \cdot 360 \cdot n / 180 \cdot \pi()) - \sin(t \cdot 360 \cdot n))$
- ◆ $yt = 20 \cdot (1 - \cos(t \cdot 360 \cdot n))$
- ◆ $t = 0$
- ◆ $zt = 0$



Ex3. Draw Heart Curve



Equation definitions for draw in NX

- ◆ $x_t = r \cdot \cos(t \cdot 360) \cdot (1 - \cos(t \cdot 360))$
- ◆ $y_t = r \cdot \sin(t \cdot 360) \cdot (1 - \cos(t \cdot 360))$
- ◆ $z_t = 0$, r = circular wheel radius , $t=0$

Name ▲	Formula
r	10
t	0
xt	$r \cdot \cos(t \cdot 360) \cdot (1 - \cos(t \cdot 360))$
yt	$r \cdot \sin(t \cdot 360) \cdot (1 - \cos(t \cdot 360))$
zt	0

