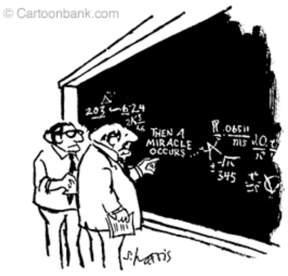


"I think you should be more explicit here in step two."

MAT 132

Arc Length

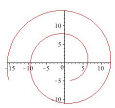
- maple parametric curves
- maple arc length
- http://mathdemos.gcsu.edu/mathdemos/catenary/catenary.html
- mathematica demo

Recall that a curve in R^2 is a function $F:[a,b]\text{->}R^2$, defined by $F(t)=(x(t),y(t))$.

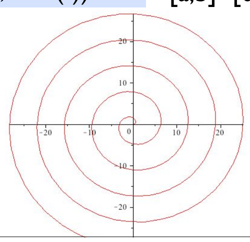
The graph of the curve is the set $\{(x(t),y(t)), t \text{ in } [a,b]\}$

Example:
$F(t)=(t\cos(t), t\sin(t))$

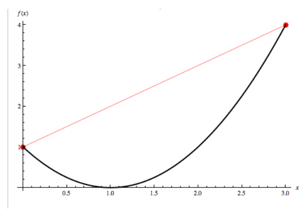
[a,b]=[5,16]

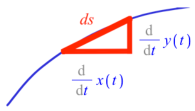


[a,b]=[0,30]



Consider the curve $f(t)=(t,(1-t)^2)$, t in [0,3].
Estimate the length of the graph of f





$F:[a,b]\text{->}R^2$, defined by $F(t)=(x(t),y(t))$.

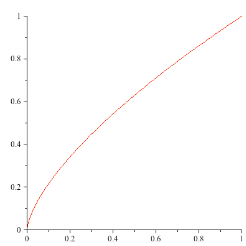
The graph of the curve is the set $\{(x(t),y(t)), t \text{ in } [a,b]\}$

The length of the curve is

$$\int_a^b \sqrt{\left(\frac{d}{dt}x(t)\right)^2+\left(\frac{d}{dt}y(t)\right)^2}\,dt$$

if the curve is traversed only once

Find the length of the curve given by the parametric equations $x(t)=t^3$ and $y(t)=t^2$, t in [0,1]

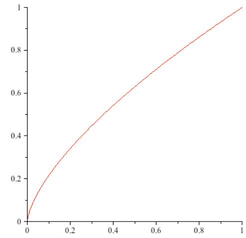


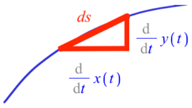
Find the length of the curve given by the parametric equations $x(t)=t^3$ and $y(t)=t^2$, t in [0,1]

$$\frac{1}{27}\left(9t^2+4\right)^{3/2}$$

$$\frac{13}{27}\sqrt{13}-\frac{8}{27}$$

Find the length of the graph of the function $F(x)=x^{2/3}$, x in [0,1]

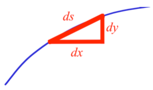




$F:[a,b]\to R^2$, defined by $F(t)=(x(t),y(t))$.
The length of the curve is

$$\int_a^b \sqrt{\left(\frac{d}{dt}x(t)\right)^2+\left(\frac{d}{dt}y(t)\right)^2}\,dt$$

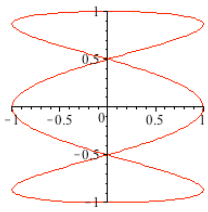
if the curve is traversed only once



$f:[a,b]\to R$,
The length of the **graph** of f is

$$\int_a^b \sqrt{\left(\frac{d}{dx}f(x)\right)^2+1}\,dx$$

Example: Estimate the length of the curve given by the function $F(t)=(\cos(3t), \sin(t))$,t in $[0,2\pi]$.



Find the length of the curve given by the parametric equations $x(t)=1-\cos(t)$ and $y(t)=t-\sin(t)$, t in $[0,2\pi]$.
What is the distance between the points at t=0 and $t=2\pi$?