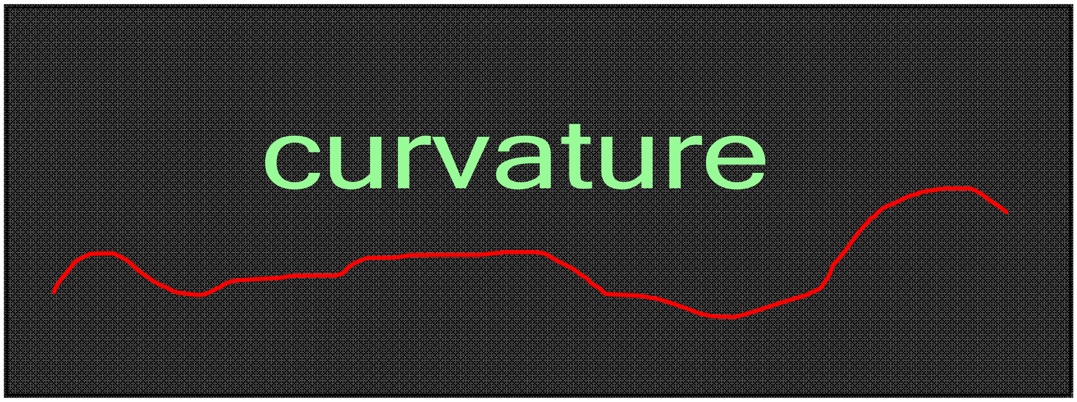



Oct 27-8:17 PM

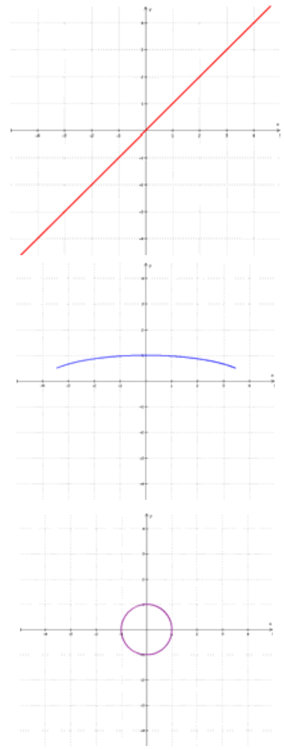
## THE CONCEPT

*imagine that we have vector valued functions which are parametrized in terms of arc length...*

Nov 9-7:53 PM

THE CONCEPT

*find* $\vec{T}$ at various values of $s$



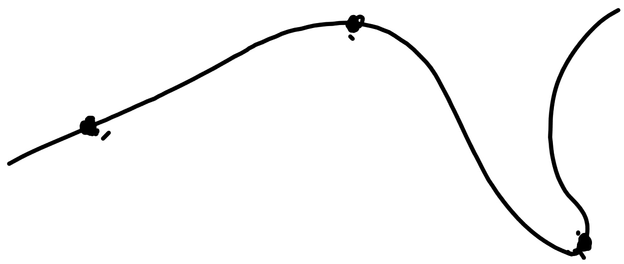
Nov 9-7:53 PM

Curvature of a function is basically how fast the direction of the tangent vector changes over time...

$$\kappa(s) = \left\| \frac{d\vec{T}}{ds} \right\| = \|\vec{r}''(s)\|$$

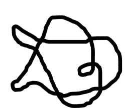
$\kappa$

Nov 9-8:00 PM



Nov 14-9:34 AM

"The situation in 3-space is more complicated because bends in a curve are not limited to a single plane -- they can occur in all directions, as illustrated by

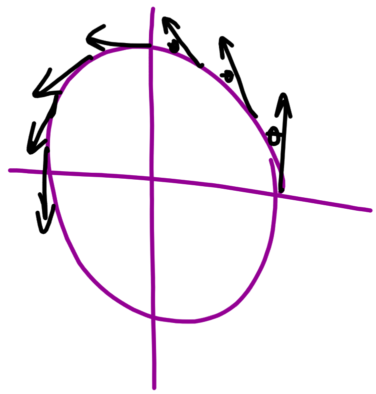


To describe the bending characteristics of a curve in 3-space comnpletely, one must take into account dT/ds, dN/ds, and dB/ds. A complete study of this topic will take us too far afield, so we will limit our discussion to dT/ds, which is the most important of these derivatives in applications." (Anton, 874)

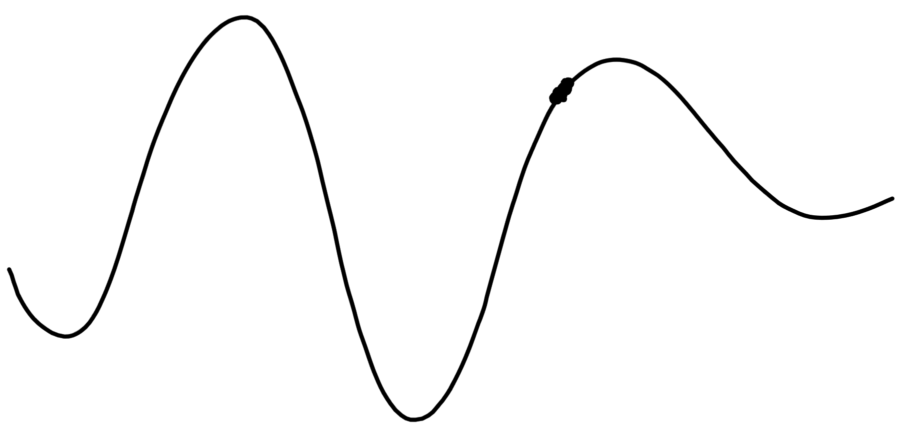
Nov 9-8:08 PM

TRUE OR FALSE:

A circle will have a constant curvature.



Nov 9-8:07 PM



Nov 14-9:42 AM

$\|\vec{r}'(s)\| = 1$ $\quad \vec{r}(s) = < a\cos(\frac{s}{a}), a\sin(\frac{s}{a}) >$

$\rightarrow \vec{r}'(s) = < -\sin(\frac{s}{a}), \cos(\frac{s}{a}) >$

first: does this make sense for the arc length parametrization of a circle of radius *a*?

↳ equal distance in equal time

second: find the curvature of a circle of radius *a*

Nov 9-8:05 PM

$\vec{r}(s) = < a\cos(\frac{s}{a}), a\sin(\frac{s}{a}) >$

Need $T'(s)$...

$\vec{T}(s) = r'(s) = < -\sin(\frac{s}{a}), \cos(\frac{s}{a}) >$

$\vec{T}'(s) = < -\frac{1}{a}\cos(\frac{s}{a}), -\frac{1}{a}\sin(\frac{s}{a}) > =$

$\|T'(s)\| = \frac{1}{a}$

Nov 14-9:48 AM

## formulas for curvature

$$\kappa(t) = \frac{\left\|\vec{T}'(t)\right\|}{\|\vec{r}'(t)\|}$$

$$\kappa(t) = \frac{\left\|\vec{r}'(t)\times\vec{r}''(t)\right\|}{\|\vec{r}'(t)\|^3}$$

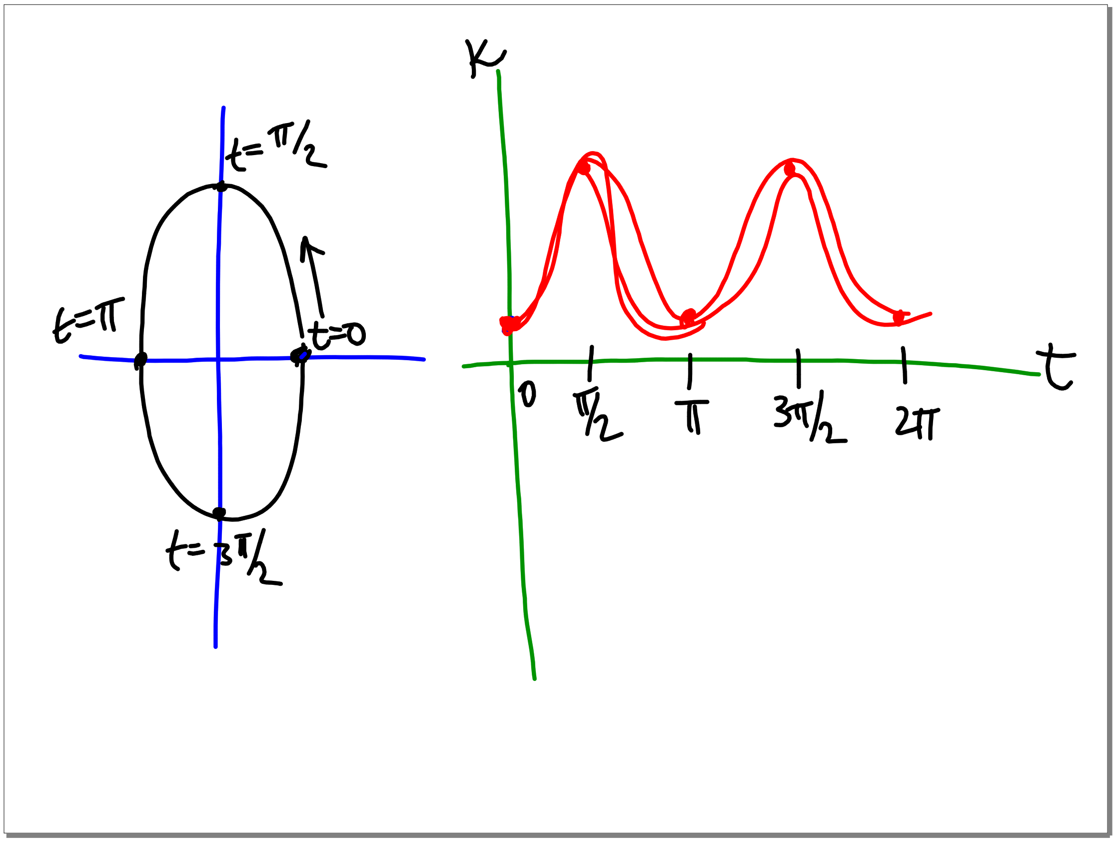
(see 893-894 for the proof)

Nov 9-8:08 PM

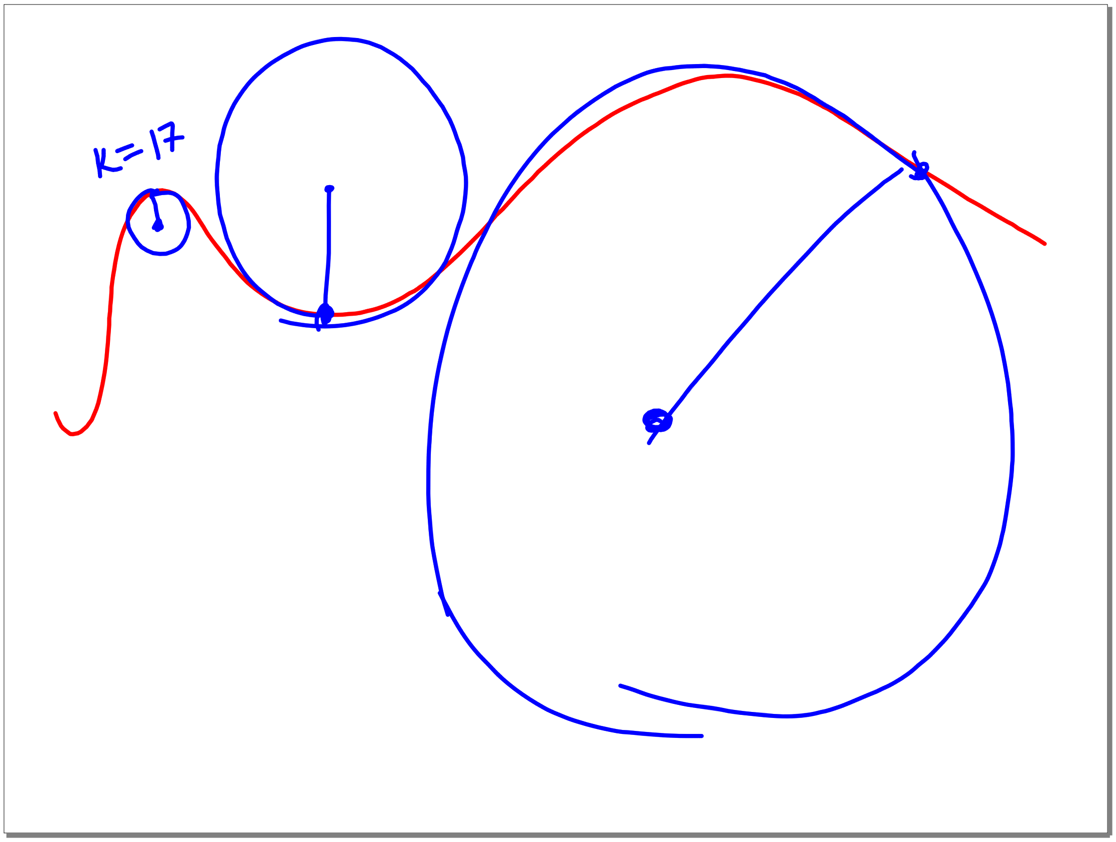
Find the curvature function for the circular helix:

$$\vec{r}(t) = < a\cos(t), a\sin(t), ct >$$

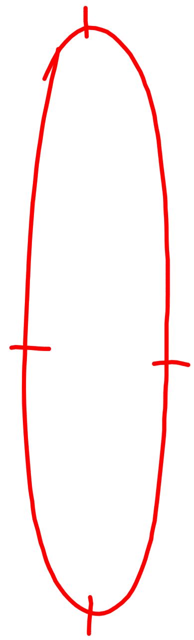
Nov 9-8:17 PM




Nov 14-9:57 AM




Nov 14-10:09 AM



Nov 14-10:07 AM

Find the curvature function for the ellipse:

$$\vec{r}(t) = < 2\cos(t), 3\sin(t) >$$

Plot this curvature function on WinPlot and explain the result with reference to the original ellipse.

Nov 9-8:19 PM

Home Enjoyment:

1. Read p. 877 on the radius of curvature
2. Section 12.5#1-4,5,6,7,9

Nov 9-8:20 PM

Oct 28-3:20 PM