Math2310 - Fall '22

Syllabus - Lecture 08 [subject to change]

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Review

1 Derivatives of important vector quantities

- derivative of the magnitude of a vector and related
  - derivative of the magnitude of a vector
  - derivative of the magnitude squared of a vector
  - derivative of the distance of a vector
- geometric interpretation of the formula of the derivative of the magnitude of a vector.
- derivative of dot product with fixed vector: distance from the plane

2 Motion in space

- FTC: recovering position from velocity

Topics

1 Motion in space and acceleration

- `defn` acceleration: the rate of change of velocity.

1.1 Tangential acceleration

- `defn` Tangential acceleration
- `thm` Tangential acceleration is the rate of change of speed

1.2 Normal acceleration

- `defn` The normal vector in 2D
  - `defn` the absence of a unique normal vector in 3D
- `defn` normal acceleration: what remains of acceleration without the tangential component
- `thm` the normal acceleration is responsible for the change of direction of motion

2 Kepler's laws

3 Estimating positions at small time increments

- FTC twice: Taylor's formula.

References

Videos

Textbook

- [Ste] Chap 13.1 Vector Functions and Space Curves (complete)
- [Ste] Chap 13.2 Derivatives and Integrals of Vector Functions (complete)
- [Ste] Chap 13.3 pp904-906 (stop at curvature)

Additional material

- A cool problem about how to make the best way to make a slide from one point to another (non-technical, communicating math) The Brachistochrone, with Steven Strogatz - YouTube