Math2310 - Fall '22

Syllabus - Lecture 06

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Review

- Digression: orthonormal bases

    - The standard orthonormal basis $\hat{e}_i$

    - Components w.r.t to a different orthonormal basis

- `defn` Vector functions of one real variable

Topics

1 Vector functions and space curves [1,2]

1.1 Constructing paths

- Polar coordinates: a review

- `exmpl` Spirals

- Uniform circular motion: its parameterization.

    - The parameters that govern: starting point, rotational frequency, radius, direction of rotation

- Constructing a spiral in 3D

- Using an orthonomal basis to construct a tilted spiral in 3D

1.2 Derivatives of paths [3]

- `defn` derivative of a path: the velocity vector

- algebra of derivatives of paths

1.3 More about velocity [4]

- `defn` speed - the magnitude of the velocity

- direction of velocity: the unit tangent vector

- tangent directions to paths [5]

References

Videos

1. Curves, Parameterizations, and the Arclength Parameterization - YouTube (watch Arclength but stop at "Archlength parameter" 7:20)

2. Parametric curves | Multivariable calculus | Khan Academy - YouTube

3. Position vectors, velocity and speed - YouTube

4. Worked problem - Find the Velocity, Speed, and Acceleration Given the Position Function (Vector Valued Functions) - YouTube

5. 3D Curves and their Tangents | Intro to Vector-Valued Functions - YouTube

6. How long is a curve?? The Arclength Formula in 3D - YouTube

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