MATH 249

Today

1. Questions from last time
2. 13.4: Velocity and Acceleration (Understand the relationships among position, velocity, and acceleration and how to calculate them given one.)
3. WeBWorK

13.4 Acceleration

Let $\vec{r}(t) =< f(t), g(t), h(t) >$, and let C be the space curve determined by $\vec{r}$.

1. If $\vec{r}(t)$ gives position, $\vec{v}(t) = \vec{r}\,'(t)$ gives velocity and $\vec{a}(t) = \vec{r}\,''(t)$ gives acceleration.
2. $v(t) = |\vec{r}\,'(t)|$ is speed.
3. $\vec{a} = v'\vec{T} + \kappa v^2\vec{N}$ $\quad[\vec{v} = v\vec{T} \implies \vec{v}\,' = v'\vec{T} + v\vec{T}' = v'\vec{T} + v|\vec{T}'|\vec{N} = v'\vec{T} + \kappa v^2\vec{N}$ since $\kappa = \dfrac{|\vec{T}'|}{|\vec{r}\,'|}$.]
4. Examples: p. 846: 18, 19, 21, 33
5. Review:
   (a) 3D Coordinates
   (b) Vectors
      i. Dot product (definition, $\vec{u}\cdot\vec{v} = |\vec{u}||\vec{v}|\cos(\theta)$)
      ii. Cross product (definition, $|\vec{u}\times\vec{v}| = |\vec{u}||\vec{v}|\sin(\theta)$, area of a parallelogram, volume of a parallelepiped)
      iii. Equations of lines and planes
      iv. Projections
   (c) Quadric surfaces
   (d) Vector-valued functions
      i. Derivatives and integrals [Expect a TL problem]
      ii. Arc length and curvature
      iii. T, N, and B
      iv. Velocity and acceleration

Next Time

(a) Exam!!!

(b) Logistics:

   i. Begin 5 minutes early, end 5 minutes late.
   ii. Problems will appear on one page.
   iii. Calculator is okay but not needed. (No Python on first exam.)
   iv. Take a picture and upload your exam to the WISE assignment when finished.

(c) Watch 14.1 for after exam [$\sim$ 31 min]