Study recommendations.

Work the 19 final exam review problems. Solutions will be posted in groups. The solutions for the first 5 problems (chapters 1, 2, 3) will be posted on Tuesday (tomorrow).

Look at mid-term review problems.
Go over the homework problems.

Leaf through the chapters and make sure you understand the boxed equations.

Read the text and study the examples.

In class today, I showed some slides pertaining to chapters 1, 2, 3 that were used previously. What follows here are just the overviews of those three chapters.

Chapter 1 Retrospective

Vectors

Dot product $\vec{A}\cdot\vec{B} = |A||B|\cos\theta$

Orthonormal bases $\vec{e}_i$

Components $A_i = \vec{A}\cdot\vec{e}_i$

Cross product $\vec{A}\times\vec{B}$ length $|A||B|\sin\theta$

Derivative operator $\vec{\nabla}$ "del"

Gradient $\vec{\nabla} f$

Divergence $\vec{\nabla}\cdot\vec{A}$

Curl $\vec{\nabla}\times\vec{F}$

Laplacian $\nabla^2 f = \vec{\nabla}\cdot\vec{\nabla} f$

Polar coordinates (spherical, cylindrical)

Gauss' Law

$$\int_V \vec{\nabla}\cdot\vec{g}\, dv = \int_A \vec{g}\cdot\vec{da}$$

A = oriented boundary of V

Stokes' Theorem

$$\int_A (\vec{\nabla}\times\vec{F})\cdot\vec{da} = \int_C \vec{F}\cdot\vec{dl}$$

C = oriented boundary of A

Chapter 2 Review

$\vec{F} = m\vec{a}$

Solve for $\vec{r}(t)$, position as function of time, given a starting position $\vec{r}(0)$ and initial velocity $\vec{v}(0)$, using a known force $\vec{F}(\vec{r})$.

Examples

Sliding on an inclined plane
Projectile motion
Weight with ropes and pulleys.

Conservative force: $\vec{F} = -\vec{\nabla} U \Leftrightarrow \vec{\nabla} \times \vec{F} = 0$

Examples: gravity $\vec{F} = -mg\,\vec{k}$ $\quad U = mgz$

spring $\vec{F} = -k(x - x_0)$ $\quad U = \frac{1}{2}k(x - x_0)^2$

Non-conservative force $\vec{\nabla} \times \vec{F} \neq 0$, no potential energy.

Examples: Friction

Air resistance

Work $\quad W = \int_1^2 \vec{F} \cdot \vec{dr}$

Path independence $\Leftrightarrow$ "work function" $\Leftrightarrow$ potential energy

$T + U =$ constant if motion is governed by a conservative force with potential energy U.

T = kinetic energy $= \frac{1}{2} m v^2$