Review Notes for chapters 28 - 29

Introduction
The central content of these chapters is the relation between magnetic field and current (i.e. any charge in motion). The ideas fall into two distinct groups. First, the Lorentz law / Ampere's law group describes just how the magnetic field exerts a force on any moving charge...and the flip side...how any moving charge creates a magnetic field. Second, the Faraday's law / Lenz' law group describes what happens when the magnetic field itself is changing with time...namely that an Emf will be observed around any loop through which the magnetic flux is changing.

I  Lorentz Force Law  describes just what force a moving charge will experience.  
You Should Know ...
* form for a moving point charge,
* form for force on a segment of current-bearing wire.

Necessary Technical Tools...
* familiarity with cross-product and right - hand rule.

Typical Problems to Know About (derive!  don't memorize)...  
* circular motion of a point charge in a uniform B-field.
* force on a straight length of wire in a uniform B-field.

II  Ampere's Law  describes what magnetic field you get from a given current.  
Necessary Technical Tools...
* meaning of circulation and threading current
* choosing Amperian loops to utilize symmetry
* conventions on orientations of loops and surfaces.

Typical Problems to Know About (Derive!  don't memorize)...  
* straight wire bearing a constant current
* sheet of current
* solenoid and toroid.

IIIa  Faraday's Law  describes the Emf generated by a changing magnetic flux.  
Necessary Technical Tools...
* meaning of "flux"
* meaning and use of concept "Emf"
**IIIb**  
*Lenz' law* describes the directions of generated Emfs and forces. This law is really contained in Faraday's law if you use the sign conventions fully (and not just magnitudes). Most people tend to remember Lenz' law separately.

*General Skills ...*

- parametrization of physical integrals
- exploiting symmetry
- checking dimensions
- superposition (wherever possible)
- $\vec{F} = m\vec{a}$