Study Guide for the Midterm
ASTR340 – Fall 2008

Will cover all material to class on black holes included.

1. **Study class power point presentation available on the class website**
2. **Study homework and solutions available online**
3. **Come to class!**

Important equations, concepts and people:

Greek and renascence Cosmology:

Geocentric system
Copernican revolution and heliocentric system
Epicycles
Aristotle, Ptolemy, Aristarchus, Copernicus, Tycho Brahe, Kepler, Galileo

Classic Physics:

1 Kepler's laws:
- **1 orbit of planets are ellipses**
- **2 law of motion on the orbit: equal areas swept per unit time**
- **3 law for period and semi major axis of orbit: R^3/P^2=const**

2 Newton's laws:
- **1 natural motion in inertial frame of reference**
- **2 F=m a**
- **3 Action and reaction**

3 Conservation of momentum: p = m v =const

4 Newton's gravity law:
$F=GMm/r^2$

5 Galileo weak equivalence principle: all bodies fall at the same rate

6 Galilean relativity: law of addition of velocities

Relativity:

1 postulates of special relativity: all inertial frames are equivalent + speed of light is constant in any frame of reference
2 time dilation and space contraction by factor gamma (Lorentz factor)
3 The concept of time and simultaneity in relativity

4 The concept of mass and energy in relativity: $E=m c^2$
5 Space-time diagrams
6 twins paradox
7 General relativity and the strong equivalence principle
8 Curved space-time and geodesic
9 applications of general relativity (GR)
10 observational and experimental tests of GR
11 black holes: rotating and non-rotating black holes