

Ay162, Spring 2006
Concepts, Weeks 7-8

Review class notes and
Ch. 23, 24, 25

Pulsars

- rotating neutron stars
- strong magnetic fields
- beamed radio radiation

Planets around pulsars
how detected?

Binary stars & novae

General relativity

Principle of equivalence

Light subject to gravity
can be deflected
redshifted

Nothing travels faster than light

Looking to great distances means
looking back in time

Matter in universe curves spacetime

Light follows geodesics (shortest paths)

Tests of general relativity
gravitational redshift
bending of starlight near sun
binary pulsar

Black holes

- gravity so strong light cannot escape

Schwarzschild radius
3km for 1 solar mass

Matter falling into black hole very hot
emits X-rays

Falling into black holes
What does outside observer see?
What does "falling in" observer see?

Supernova as origin of black holes, also
star clusters. centers of galaxies

S. Hawking & possible evaporation
of black holes

Milky Way Galaxy
spiral arms, thin disk,
spheroidal bulge and halo
30,000 pc or 100,000 light yr diam.
location of sun in galaxy

Herschel - 1st attempt to determine
nature, size of galaxy

Shapley - use of globular clusters to
locate direction and distance to
center of galaxy

Baade – Populations I and II
understand relation of age
composition, orbits of stars,
what they imply about evolution
of galaxy

Rotation of galaxy
sun's orbit and period (how many
years?)

How is rotation determined?

Mass of galaxy from rotation,
at least 100 billion solar masses

Spiral arms and their origin
what obs. show Milky Way is
a spiral?

Why are spiral arms not expected
to last very long?

What process does keep them visible?

Center of galaxy

Dust blocks visible light,
studied w. X-rays, IR, radio
high density of stars
evidence for black hole at center

Dark matter – Why do we think there
is much of it? What could it be?

Theories of formation of galaxy
concentration of matter at center
top-down, bottom-up concepts
recycling, enrichment of ISM from
evolution of stars, SN
heavy elements in stars build up
with time