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web site: <u>www.as.utexas.edu</u> Go to Department of Astronomy courses, AST 301 (Lacy), course website



The Astronomy Department hosts three weekly viewing nights for the public while UT is in session.



Wednesday Nights at R.L.M. Hall



Fridays and Saturdays at Painter Hall

Assignment for this week

Read Chapters 1 and 2.

If you haven't yet, find a place where you can see the western horizon and look for Venus, Mars, and Spica.If it is clear enough to see them, make a sketch and write down the date, time, place, weather, and names of companions.

The homework due this Friday is on <u>www.as.utexas.edu</u> and in one of the mailboxes outside of the classroom.

Quiz

- If you were standing at the north pole and watched the sky for 24 hours, you would see the big dipper ...
- A. remain stationary in the sky
- B. circle around the sky
- C. rise in the east and set in the west, passing directly overhead
- D. rise in the east and set in the west, passing south of overhead

Apparent motion of stars during a night

The Earth rotates on its axis through the poles once a day.

- The west-to-east rotation makes stars appear to move east-to-west, generally rising in the east and setting in the west.
- The appearance is the same as if the stars were on a giant sphere surrounding the Earth, which rotates east-to-west about an axis running through the Earth's poles.
- This imaginary sphere is referred to as the celestial sphere.
- The axis of rotation passes through the celestial poles, which are directly above the Earth's poles.
- The celestial equator is a line on the celestial sphere above the Earth's equator.



Quiz

If you watch the sky during a night in Austin, Polaris will...

- A. rise in the northeast, pass north of overhead, and set in the northwest
- B. rise due east, pass near overhead, and set due west
- C. rise due east, pass north of overhead, and set due west
- D. remain stationary near overhead
- E. remain stationary about 30° above the north horizon

Quiz

- As seen from Austin, Orion rises near due east. During a night it ...
- A. passes near overhead and sets near due west
- B. passes south of overhead and sets near due west
- C. passes near overhead and sets in the southwest
- D. passes south of overhead and sets in the southwest

Apparent motion of Sun during the year

The Earth orbits the Sun once a year.

- This makes the Sun appear to pass in front of different stars (the constellations of the zodiac) during a year.
- The zodiac does not lie on the celestial equator, but is on a circle tipped about 23° from the equator.
- This is because the axis of the Earth's rotation is tipped about 23° from the axis of its orbital motion.
- During a day the Sun follows the same path across the sky as the stars it is in front of, since this motion is caused by the rotation of the Earth.
- But from day to day the Sun slowly moves along the zodiac (also called the ecliptic).
- This causes it to rise with different stars and to move north and south of the celestial equator during a year.



The solar day and the sidereal day

The motion of the Sun along the ecliptic causes the time from sunrise to sunrise (the solar day = 24 hours) to differ from the time from when one star rises until when it next rises (the sidereal day = 23 hours, 56 minutes).

There are 365.24 solar days in a year. How many sidereal days are there in a year?

Figure out the rule by having the "Earth" walk around the "Sun" while spinning on her axis.

How would it change if the Earth spun the other way?



Seasons

- The fact that the ecliptic is tipped relative to the celestial equator means that at some times of the year the Sun is in front of stars north of the equator and at some times it is south.
- Stars on the equator rise due east, pass 30° south of overhead (seen from Austin), and set due west.
- Stars north of the equator rise north of east, pass closer to overhead, and set north of west.
- Stars south of the equator rise south of east, pass more than 30° south of overhead, and set south of west.

What path is the Sun currently following across the sky? If you don't know, watch it.









The earth's axis of rotation always points toward the same place in the stars (the celestial pole), even as the earth goes around the sun. The polar axis is tilted by 23.5 degrees with respect to the <u>ecliptic plane</u>





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Summer solstice light



Winter solstice light