How can the planets Jupiter, mars and saturn rise in the east and circle around to the west, but the big dipper rises in the morth, and circles the north star?

Answer

The phenomena you're describing are due to the combination of Earth's rotation, its orbit around the Sun, and the positions of celestial bodies relative to Earth's axis:

Planets Rising in the East and Setting in the West:

- **Planetary Motion and Earth's Rotation**: All celestial objects, including planets like Jupiter, Mars, and Saturn, rise in the east and set in the west due to Earth's rotation on its axis from west to east. This daily motion makes it appear as if all stars and planets move across our sky from east to west over the course of a night.
- **Orbital Motion**: However, planets have their own orbits around the Sun, which adds complexity to their apparent motion through our sky:
  - **Retrograde Motion**: Occasionally, planets like Mars, Jupiter, and Saturn appear to move backward (from west to east) against the background stars. This happens because Earth, orbiting faster than these outer planets, overtakes them.
  - **Change in Rise and Set Times**: Over days, weeks, and months, the times when these planets rise and set change as their positions in the sky relative to the Sun change due to their orbits.

The Big Dipper and Circumpolar Constellations:

- **Circumpolar Motion**: The Big Dipper, part of the Ursa Major constellation, is circumpolar if observed from latitudes in the northern hemisphere above roughly 41 degrees north (the latitude south of which the Big Dipper would start to dip below the horizon). Circumpolar means these stars never set below the horizon; they appear to rotate around the North Star (Polaris), which is nearly aligned with Earth's north celestial pole.
  - **Why It Circles Polaris**:
    - The Earth's axis points toward Polaris, so stars near this pole, like those in the Big Dipper, appear to circle around Polaris as the Earth rotates. This gives the illusion of these stars moving in a small circle around the North Star throughout the night, never rising or setting like planets do from most northern latitudes.
- **Latitude Effect**:
  - The further north you are, the higher Polaris is in the sky, and thus, more stars become circumpolar. From the equator, Polaris is on the horizon, and no stars are circumpolar. Moving north, more stars, including the Big Dipper, become circumpolar.

In Summary:

- Planets follow the general pattern of rising in the east and setting in the west due to Earth's daily rotation, but their exact times and paths in the sky change nightly due to their orbits around the Sun relative to Earth's orbit.
- The Big Dipper, being close to the celestial north pole from our perspective on Earth, appears to circle the North Star because of how Earth's axis is oriented in space, not setting below the horizon in the northern latitudes where this occurs.

This contrast in movement is due to the combination of Earth's rotation, the planets' orbital dynamics, and the viewer's latitude on Earth.