4 Adv Spatial Viz P1

What is a Coordinate Reference System (CRS)?
- Key Concepts
  - Coordinate Reference System (CRS) is a system that defines how the two-dimensional, projected map in your computer relates to real locations on the Earth ⌗
  - A CRS involves defining the shape of the Earth (via an ellipsoid or datum) and how that shape is positioned relative to the coordinate grid applicable to a particular area ⌗
  - Using a CRS ensures that spatial data, maps, shapefiles, coordinates, are consistent and accurate when you combine or compare datasets from different sources or regions
- Why CRS Matters (for GIS / spatial data work)
  - When you overlay datasets having a common CRS ensures that the layers align correctly. Without that, points will be mis-located and analysis will be meaningless.
  - If you move between local (e.g. state-level) maps, global datasets, or different coordinate formats, CRS ensures consistency.
  - Understanding CRS prevents common errors in spatial projects: misalignment, distortions, inaccurate distances or areas, and faulty analyses.

Appendix D — Spatial Data
1. Spatial Data = Data Tied to Location
   - vector = points, lines, polygons
   - raster = grids
2. CRS is Crucial
   - CRS tells R how coordinates relate to the earth
   - geographic CRS (lat/long, degrees): good for location
   - projected CRS (meters): required for distance & area calculations
3. The sf Package is How R Handles Spatial Data
   - st_read(): load spatial data
   - st_crs(): check CRS
   - st_transform(): change CRS
   - geom_sf(): map the data
   - st_join(): spatial join (match by location)
4. Spatial Joins Match Data Using Geography, Not IDs
   - example: assign each point (like a city) to its county polygon
5. Most Common Error: Mismatched CRSs
   - if layers don't line up, transform both to the same CRS