

## Key Concepts for the Lecture of 2Jul03

### Galilean Relativity

- Position is meaningless except in the context of a frame of reference. We quantify frames of reference with coordinate systems. Position is always with respect to a frame of reference.
- Velocity is the change of position with time. Consequently velocity must always be expressed with respect to a coordinate system fixed in a frame of reference.
- We notate “the velocity of thing C with respect to thing D” as  $v_{CD}$ . “Thing C” and “thing D” may be objects of interest, or they may refer to moving coordinate systems or frames of reference.
- Velocities Add. If an object Q is moving in with respect to frame A with velocity  $v_{QA}$ , and frame A itself is moving with respect to frame B with velocity  $v_{AB}$ , then the velocity of object Q with respect to frame B is

$$\vec{v}_{QB} = \vec{v}_{QA} + \vec{v}_{AB}$$

- Note that in this notation, adjacent like subscripts “cancel” to help you keep track of what is moving with respect to what:

$$\vec{v}_{AF} = \vec{v}_{AR} + \vec{v}_{RB} + \vec{v}_{BQ} + \vec{v}_{QF}$$

- There’s actually some very deep physics here that we’re skimming over lightly. The key idea is that velocities add. But we will soon learn that this principle is only true in the limit of small velocities.