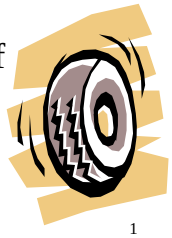
Chapter 12-2 and 12-3

The Rolling Wheel and Instantaneous Center of Rotation



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Objectives

- Relate relative motion to the rolling wheel
- Determine where the apparent center of motion for a system is
- Use center of rotation to determine velocities

2

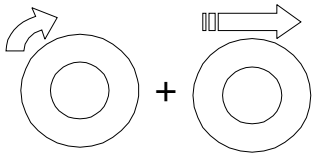
The Rolling Wheel

- Wheels (like tires) have both angular and rectilinear motion.
  - –Imagine a wheel spinning above the pavement, going nowhere.
  - –Imagine a wheel with locked brakes, sliding on ice.

3

The Rolling Wheel (2)

- Now add the two velocities together.



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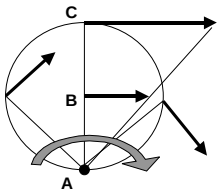
Rolling Wheel Velocities

- V_A is zero
- V_B is 4 m/s
- V_C is 8 m/s



5

Rules of the Road

- The wheel rotates at ω rad/s
- Find velocity based on r ω, where r = distance to POINT OF ROTATION, not necessarily Center of Rotation.

6

Book Examples

Examples 12-9 and 12-10

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Instantaneous Center of Rotation

- When an object rotates, there is a point at which all velocities of the object appear to be tangential.
- Example: A rotating wheel touches the ground at its Instantaneous Center of Rotation.
  - See Slide 5 – look at vectors.

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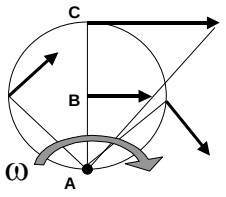
Inst. Center of Rotation

- Since $v = r \omega$

  $\omega = V_B/AB = V_C/AC$



9

Using Center of Rotation

Only works for velocities.

Do not use for accelerations.

10

Book Examples

Examples 12-11 and 12-13

11

Week 7 Homework

- Chapter 12
  - Problems 28 thru 34
- Read Sections 13-1 thru 13-3

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