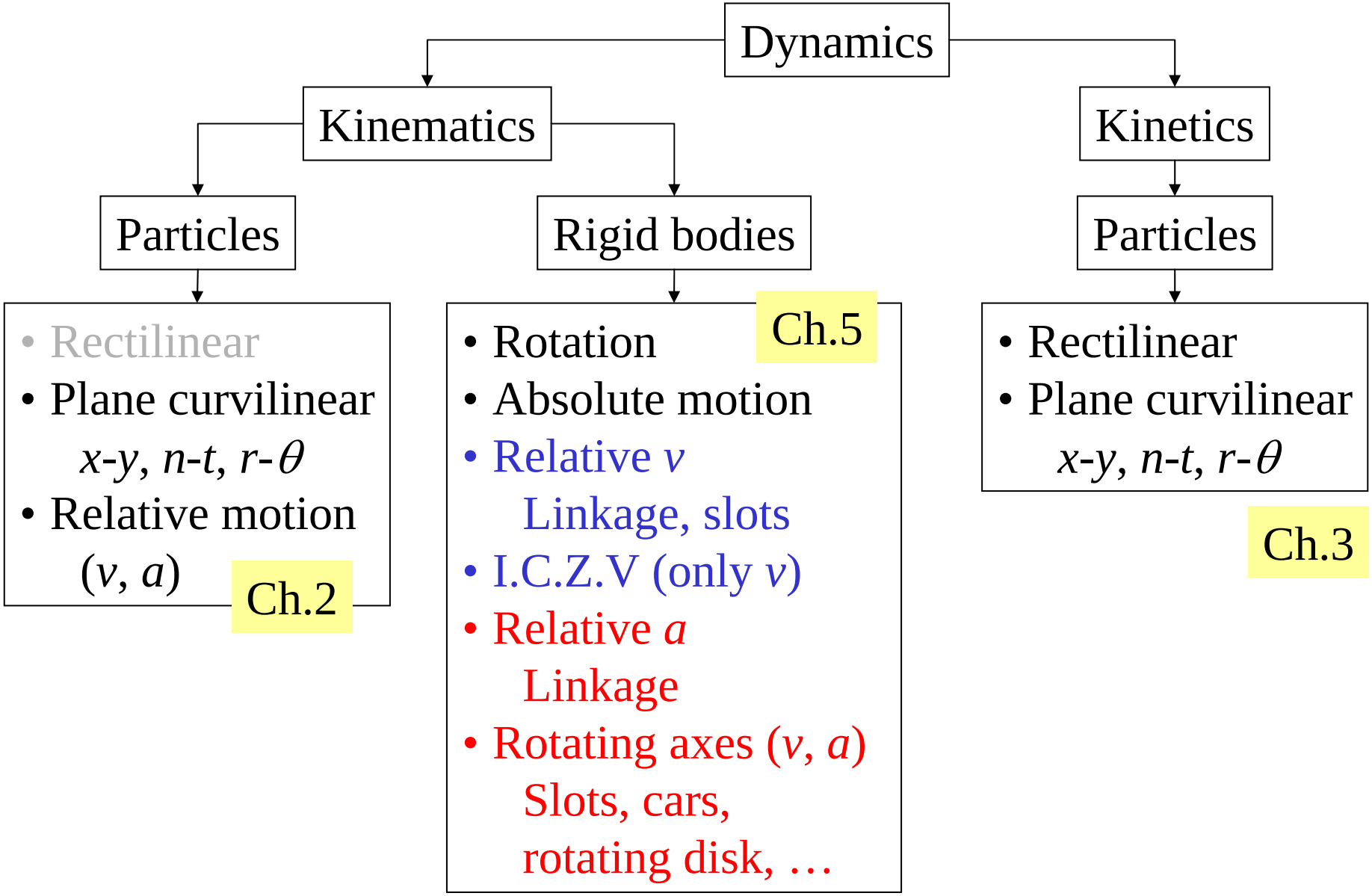
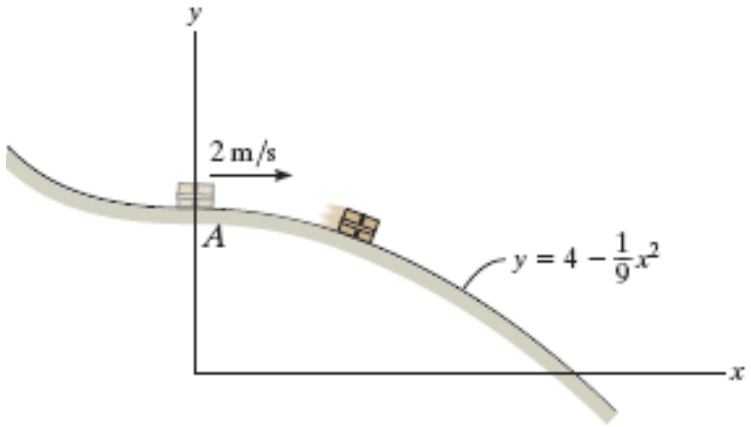
Summary


Dynamics
Kinematics
Kinetics
Particles
Rigid bodies
Particles
• Rectilinear
• Plane curvilinear
x-y, n-t, r-θ
• Relative motion
(v, a)
Ch.2
• Rotation
• Absolute motion
• Relative v
Linkage, slots
• I.C.Z.V (only v)
• Relative a
Linkage
• Rotating axes (v, a)
Slots, cars,
rotating disk, …
Ch.5
• Rectilinear
• Plane curvilinear
x-y, n-t, r-θ
Ch.3

Sample 13-77

The 25-kg box has a speed of 2 m/s when it is at A on the smooth ramp. If the surface is in the shape of a parabola, determine the normal force on the box at instant x = 3 m. Also, what is the rate of increase in its speed at this instant?



Prob. 13–77

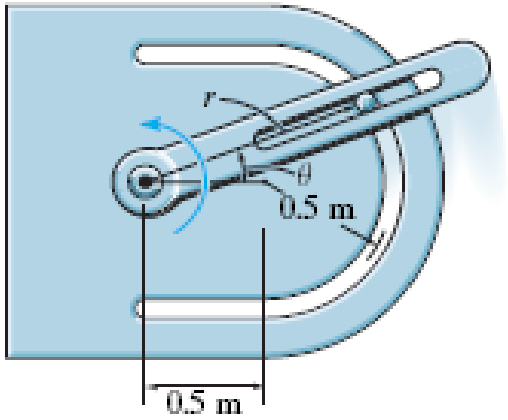
$N = 180$ N

$a_t = 5.44$ m/s^2

Sample 13-90

The 5-N (≈0.5 kg) particle is guided along the circular path using the slotted arm guide. If the arm has an angular velocity $\dot{\theta} = 4$ rad/s and an angular acceleration $\ddot{\theta} = 8$ rad/s^2 at the instant $\theta = 30^o$, determine the force of the guide on the particle. Motion occurs in the *horizontal plane*.

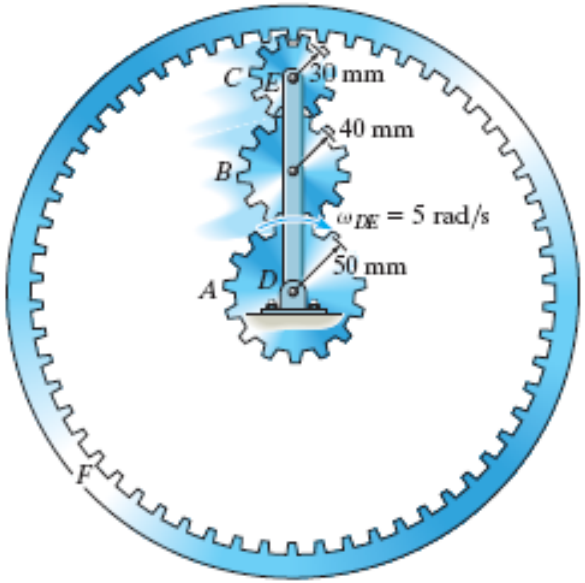
$F = 4.71\ N$



Prob. 13–90

Sample 16-91

The epicyclic gear train is driven by the rotating link DE, which has an angular velocity $\omega_{DE} = 5$ rad/s. If the ring gear F is fixed, determine the angular velocities at gears A, B, and C.



Prob. 16–91

$\omega_C = 26.7$ rad/s

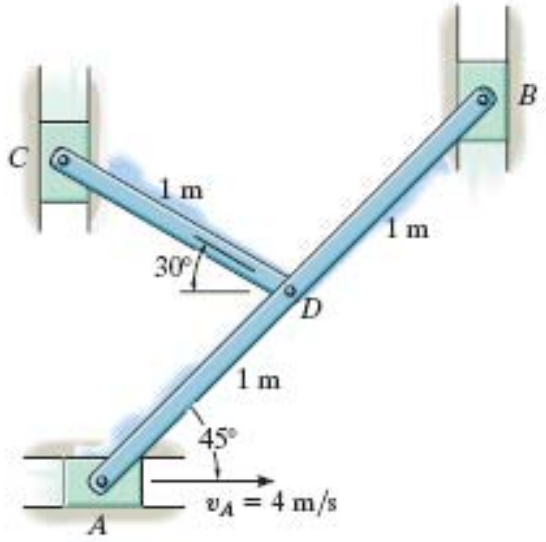
$\omega_B = 28.75$ rad/s

$\omega_A = 14.0$ rad/s

Sample 16-102

If the slider block A is moving to the right at $v_A = 4$ m/s, determine the velocities of blocks B and C at the instant shown.

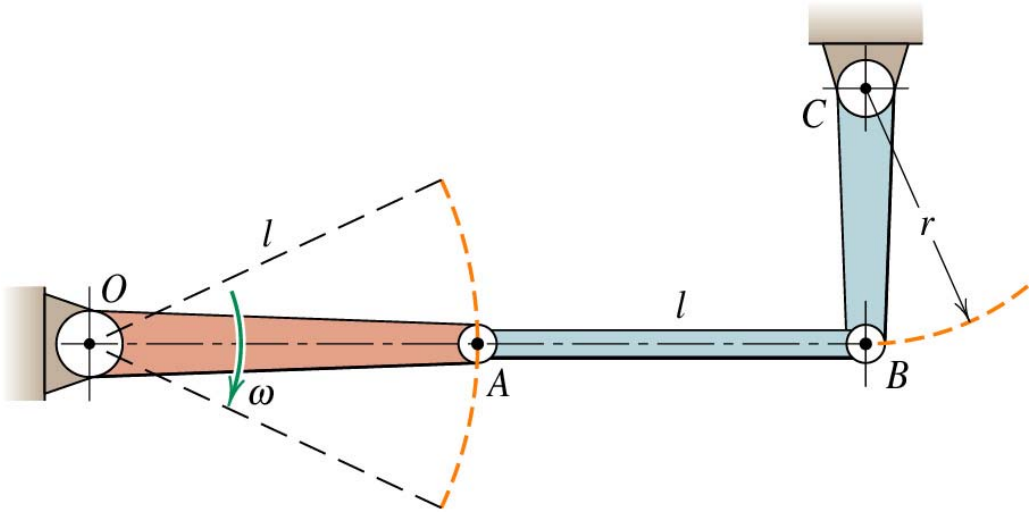
$v_B = 4.0$ m/s
$v_C = 1.46$ m/s



Prob. 16–102

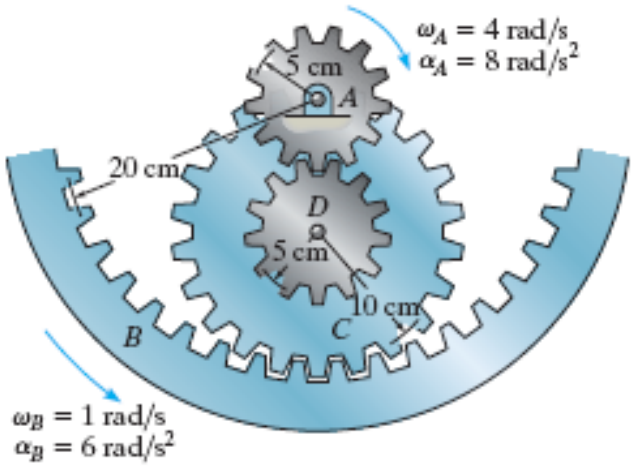
Sample 5/135

Crank *OA* oscillates between the dashed positions shown and causes small angular motion of crank *BC* through the connecting link *AB*. When *OA* crosses the horizontal position with *AB* horizontal and *BC* vertical, it has an angular velocity ω and zero angular acceleration. Determine the angular acceleration of *BC* for this position.



Sample 16-122

At a given instant gears *A* and *B* have the angular motions shown. Determine the angular acceleration of gear *C* and the acceleration of its center point *D* at this instant. Note that the inner hub of gear *C* is in mesh with gear *A* and its outer rim is in mesh with gear *B*.



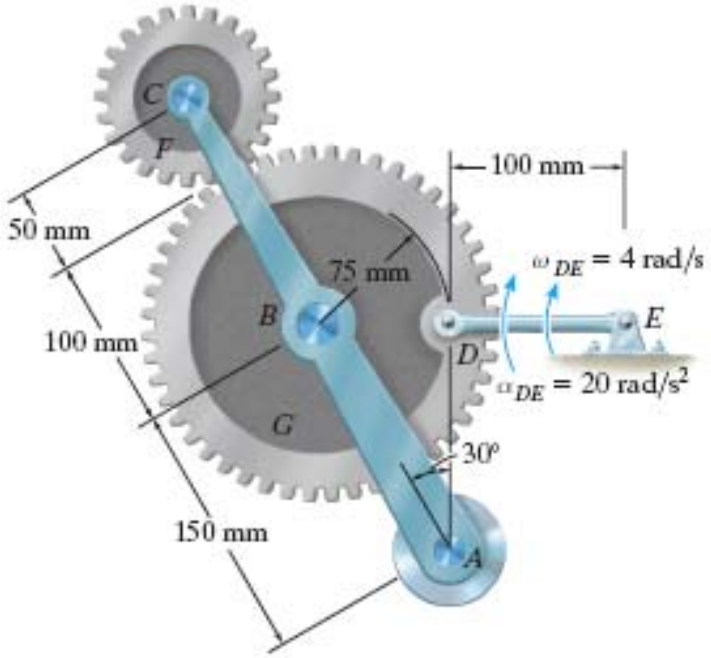
Prob. 16–122

$\alpha = 10.67$ rad/s^2 CCW

$a_D = 14.1$ cm/s^2

Sample 16-123

If link *DE* has the angular motion shown, determine the respective angular velocities of *F* and crank *AC* at this instant, and the angular acceleration of crank *AC*.



Prob. 16–123

$\omega_{AC} = 0$ rad/s

$\omega_F = 10.7$ rad/s

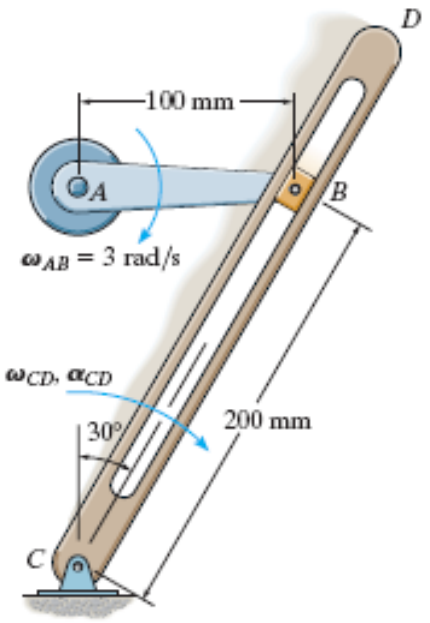
$\alpha_{AC} = 28.7$ rad/s² CW

Sample 16-141

Block *B* of the mechanism is confined to move within the slot member *CD*. If *AB* is rotating at a constant rate of $\omega_{AB} = 3$ rad/s, determine the angular velocity and angular acceleration of member *CD* at the instant shown.

$\omega_{CD} = 0.750$ rad/s

$\alpha_{CD} = 1.95$ rad/s^2

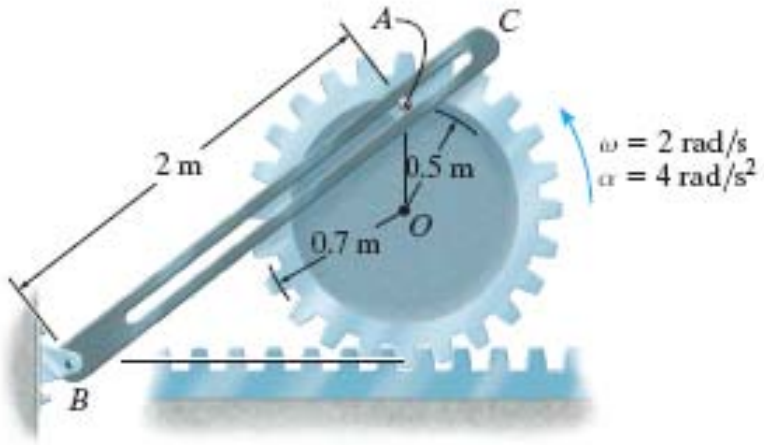


Prob. 16–141

Sample 16-145

The gear has the angular motion shown. Determine the angular velocity and angular acceleration of the slotted link *BC* at this instant. The peg at *A* is fixed to the gear.

ω_{BC} = 0.720 rad/s CCW
α_{BC} = 2.02 rad/s^2 CCW



Prob. 16–145