# Content

[Content 0](#_Toc55803329)

[Axis 0](#_Toc55803330)

[Semicircular track 0](#_Toc55803331)

[Cell membership to a grid 1](#_Toc55803332)

[Causal loop pop-growth 1](#_Toc55803333)

[PSA discussion 1](#_Toc55803334)

[Root finding line+circle 2](#_Toc55803335)

[Green port causal loop 2](#_Toc55803336)

[Mechanical potential energy 3](#_Toc55803337)

[Min-med-max flowchart 4](#_Toc55803338)

[Moment of inertia 4](#_Toc55803339)

[Common moments of inertia 5](#_Toc55803340)

[Rolling down an incline 5](#_Toc55803341)

[1-d collision 6](#_Toc55803342)

[Immersed object in fluid 7](#_Toc55803343)

[Impulse-momentum 7](#_Toc55803344)

[Two-particles 8](#_Toc55803345)

[Statics: Rigid body 8](#_Toc55803346)

[Notes 9](#_Toc55803347)

[Version 9](#_Toc55803348)

# Axis

*x*

*y*

*z*

*x*

*z*

*y*

*x*

*y*

*z*

*x*

*z*

*y*

*g*



*x*

*y*

*z*

*x*

*y*

*z*



# Semicircular track

*A*

*B*

*C*

*F*

*O*

*D*

*E*

*vA*

*vB*

*μk* = 0

*μk* = 0

*vF*

*vD*

*2R*

*vE*

*vC*



*x*

*y*

*z*

# Cell membership to a grid

white: mature, red: new

# Causal loop pop-growth

*P*

*B*

*D*

+

+

–

+

*R*

*B*

# PSA discussion

*θ*

*θ*

# Root finding line+circle

*C*

*A*

*B*

*O*

*t*

*t* + 2Δ*t*

*t* + Δ*t*

*t* – Δ*t*

*v*rayΔ*t*



, , , ,  
, , ,  
, , , or the right side

# Green port causal loop

Port-driven GDP

Energy Occupation

Water Occupation

Waste Discharge

Urban GDP

+

Environmental Quality

Resources Loss

Health Risk

+

+

–

+

+

–

–

–

Green Technology

–

–

–

+

Trade

+

Port Demand

Port Pressure

+

+

+

Port Cargo Troughput

+

Port Investment

Shoreline Occupation

+

–

+

Port Cargo Troughput Capacity

+

+

–

Port Revenue

Port Profit

+

+

+

+

Population

Death

Birth

–

+

In-Migration

+

+

+

–

Life Quality

–

–

Intrastate Industry

Interstate Industry

Interstate Infrastructure

+

+

Intrastate Infrastructure

+

+

–

–

Investment

+

+

+

+

Carrying Capacity

+

# Mechanical potential energy



*y*

*m*

*m*1

*m*2

*l*

*l*

*l*



*y* + *y*0

–*y* + *y*0

*x*

*y*

*z*

*x*

*y*

*z*



*θ*

*y*

*x*

*y*

*z*

*s*



*x*

*y*

*z*

*m*1

*m*2

*l*1

*l*2

*l*1

*l*2

*θ*

*y*0 + *l*1 sin *θ*

*y*0 – *l*2 sin *θ*

*x*

*y*

*z*



*y*0 + *y*

*y*0 – *y*

*k*

*x*

*y*

*z*



Δ*h*

Δ*V*

# Min-med-max flowchart

1

Start

*x­i*,   
*i* = 1 .. *N*

*i* = 1

*j* = *i* + 1

*xi* > *xj*

*xi* ⇄ *xj*

1

*j* ≤ *N*

*j* = *j* + 1

2

2

3

3

*i* = *i* + 1

*i* < *N*

*x*min = *x*1

*x*max= *xN*

4

4



*x*med = *xm*

Start

*x*min, *x*max, *x*med

Y

N

N

Y

Y

N

..

# Moment of inertia

*m*1

*m*2

*m*3

*m*4

*r*⊥,4 = 0

*r*⊥,3

*r*⊥,2

*r*⊥,1

*dm*

*r*⊥

*M* = ∫ *dm*





# Common moments of inertia



*R* >> *L*

*L* >> *R*

*L* >> *H*

*W* >> *H*



*L*

*W*

*H*

*L*

*L*

*L*



# Rolling down an incline

*θ*

*θ*

*x*

*y*

*z*

*x*

*y*

*z*



*μs*, *uk*

*μs*, *uk*

*N*

*f*

*w*

*θ*

*N*

*f*

*w* sin *θ*

*θ*

*w* cos *θ*

*x*

*y*

*z*

*m*

*I*, *R*

*ω*, *α*

*v*, *a*

*v*, *a*

*ω*, *α*

*v*, *a*

# 1-d collision

*x*

*y*

*z*

*h*

*m*1

*m*2

*m*3

*t* = *t*0

*t* = *t*1

*t* = *t*2

*t* = *t*3

*m*0, *l*0

*v*2*i* = 0

*v*3*i* = 0

*v*2*i* = 0

*v*3*i* = 0

*v*2*f* > 0

*v*3*i* = 0

*v*3*f* > 0

*v*2*ff* < 0

*v*1 = 0

*v*1*i* > 0

*v*1*f* = 0

*μk* = 0

# Immersed object in fluid

*x*

*y*

*z*

*Lsf*

*Wsf*

*Hsf*

*Lio*

*Wio*

*Hio*

Δ*Hsf*

*Hsf* – *Hio* ≤ *y* < *Hsf*

*Asf* *'*

*Aio*

*y*1

*y*2

*y*3

*y*4

*x*

*y*

*z*

*x*

*y*

*z*

# Impulse-momentum

100

I

II

III

*F*

*t*

0.01

0.02

0.03

0.05

100

*F*

*t*

0.01

0.02

0.03

200

*Fy*

*t*

0.02

0.04

200

*Fx*

*t*

0.02

0.04

# Two-particles

*x*

*y*

*z*



*Dj, mj*

*Di, mi*

# Statics: Rigid body

*x*

*y*

*z*

*T*1



*m*, *L*

*T*2

*w* = *mg*

*l*1

*l*2

*O*

*A*

*B*

*C*

*D*

*E*

*m*, *L*

*l*1

*l*2

*O*

*A*

*B*

*C*

*D*

*E*

*O*

*A*

*B*

*C*

*D*

*E*

*O*

*A*

*B*

*C*

*D*

*E*

*O*

*A*

*B*

*C*

*D*

*E*

+

+

–

+

+

–

–

+

+

*l*1

*l*2

*l*1

*l*2

*l*1

*l*2

*T*1

*T*2

*T*2

*T*1

*w*

*w*

*x*

*y*

*z*



*m*, *L*

*T*2

*w* = *mg*

*l*1

*l*2

*O*

*A*

*B*

*C*

*D*

*E*

*T*1

*θ*1

*θ*2

*m*, *L*

*l*1

*l*2

*O*

*A*

*B*

*C*

*D*

*θ*1

*θ*2

*x*

*y*

*z*



*m*, *L*

*μ* ≠ 0

*θ*

*μ* = 0

*w* = *mg*

*N*floor

*N*wall

*f*floor

*A*

*B*

*O*

*lw,A* = ½ *L* cos *θ*

*lN*floor*,A* = *L* cos *θ*

*lf*floor*,A* = *L* sin *θ*

*m*, *L*

*μ* ≠ 0

*μ* = 0

*A*

*B*

*O*

*x*

*y*

*z*



*m*, *L*

*μ* ≠ 0

*θ*

*w* = *mg*

*TB*

*N*wall

*f*wall

*A*

*B*

*O*

½ *L*

*TB* sin *θ*

*TB* cos *θ*

*m*, *L*

*μ* ≠ 0

*θ*

*O*

½ *L*

*B*

*A*

# Notes

* 130% as for jekyll blog with MathJax
* Save as 0000x first then save as back to 0000, remove 0000x then, x = i

# Version

20201105, 20201031, 20201107, 20201109