



Newtonian Flow Formulas

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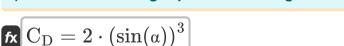




List of 14 Newtonian Flow Formulas

Newtonian Flow **3**

1) Coefficient of Drag Equation with Angle of Attack



$$= 2 \cdot (\sin(10.94^\circ))^3$$

2) Coefficient of Drag Equation with Coefficient of Normal Force

fx
$$C_D = \mu \cdot \sin(lpha)$$

Open Calculator 🗗

$$\texttt{ex} \ 0.085401 = 0.45 \cdot \sin(10.94°)$$

3) Coefficient of Lift Equation with Angle of Attack

$$\mathbf{K} \left[\mathrm{C_L} = 2 \cdot \left(\sin(lpha)
ight)^2 \cdot \cos(lpha)
ight]$$

Open Calculator 🗗

$$\mathbf{ex} \left[0.070724 = 2 \cdot \left(\sin(10.94^\circ) \right)^2 \cdot \cos(10.94^\circ) \right]$$

4) Coefficient of Lift Equation with Coefficient of Normal Force

fx
$$C_{\mathrm{L}} = \mu \cdot \cos(lpha)$$

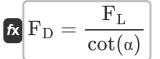
Open Calculator 🗗

$$\texttt{ex} \ 0.441822 = 0.45 \cdot \cos(10.94°)$$



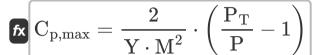


5) Drag Force with Angle of Attack



Open Calculator

6) Exact Normal Shock Wave Maximum Coefficient of Pressure



Open Calculator

7) Force Exerted on Surface given Static Pressure

$$\mathbf{f}\mathbf{x} \left[\mathbf{F} = \mathbf{A} \cdot (\mathbf{p} - \mathbf{p}_{\mathrm{static}})
ight]$$

Open Calculator 🗗

$$\mathbf{ex} \left[2.52 \mathrm{N} = 2.1 \mathrm{m}^2 \cdot (251.2 \mathrm{Pa} - 250 \mathrm{Pa}) \right]$$

8) Lift Force with Angle of Attack

fx
$$F_{\mathrm{L}} = F_{\mathrm{D}} \cdot \cot(lpha)$$

Open Calculator

$$\texttt{ex} \ 413.8778 \texttt{N} = 80 \texttt{N} \cdot \cot(10.94°)$$



9) Mass Flux Incident on Surface Area

$\mathbf{K} = \mathbf{G} \cdot \mathbf{v} \cdot \mathbf{A} \cdot \sin(\theta)$

Open Calculator 🚰

 $\mathbf{ex} \ 2.406764 \mathrm{kg/s/m^2} = 0.11 \mathrm{kg/m^3 \cdot 60 m/s \cdot 2.1 m^2 \cdot sin(10°)}$

10) Maximum Pressure Coefficient

$ext{C}_{ ext{p,max}} = rac{ ext{P}_{ ext{T}} - ext{P}}{0.5 \cdot ext{p} \cdot ext{V}_{\infty}^2}$

Open Calculator

11) Modified Newtonian Law

 $\mathbf{K} \mathbf{C}_{\mathrm{p}} = \mathbf{C}_{\mathrm{p,max}} \cdot \left(\sin(heta)
ight)^2$

Open Calculator

 $\texttt{ex} \ 0.018092 = 0.60 \cdot (\sin(10°))^2$

12) Pressure Coefficient for Slender 2D Bodies

 $\mathrm{C_p} = 2 \cdot \left(\left(\mathrm{ heta}
ight)^2 + \mathrm{k_{curvature}} \cdot \mathrm{y}
ight)^2$

Open Calculator

 $oxed{ex} \left[0.540923 = 2 \cdot \left(\left(10
ight.^{\circ}
ight)^2 + 0.2 \mathrm{m} \cdot 1.2 \mathrm{m}
ight)$



13) Pressure Coefficient for Slender Bodies of Revolution

 $\left| \mathbf{K} \right| \mathbf{C}_{\mathrm{p}} = 2 \cdot \left(\mathbf{ heta}
ight)^2 + \mathbf{k}_{\mathrm{curvature}} \cdot \mathbf{y}$

Open Calculator

- $= 2 \cdot (10^\circ)^2 + 0.2 \mathrm{m} \cdot 1.2 \mathrm{m}$
- 14) Time Rate of Change of Momentum of Mass Flux
- $\mathbf{F} =
 ho_{\mathrm{Fluid}} \cdot \mathrm{u}_{\mathrm{Fluid}}^2 \cdot \mathrm{A} \cdot \left(\sin(\theta)
 ight)^2$

- Open Calculator
- $ext{ex} \ 1.353524 ext{N} = 9.5 ext{kg/m}^3 \cdot (1.5 ext{m/s})^2 \cdot 2.1 ext{m}^2 \cdot (\sin(10\degree))^2$



Variables Used

- A Area (Square Meter)
- C_D Drag Coefficient
- C1 Lift Coefficient
- C_p Pressure Coefficient
- C_{p,max} Maximum Pressure Coefficient
- F Force (Newton)
- **F**_D Drag Force (Newton)
- **F**_I Lift Force (Newton)
- G Mass Flux(g) (Kilogram per Second per Square Meter)
- **k**_{curvature} Curvature of Surface (Meter)
- M Mach Number
- p Surface Pressure (Pascal)
- P Pressure (Pascal)
- p_{static} Static Pressure (Pascal)
- P_T Total Pressure (Pascal)
- UFluid Fluid Velocity (Meter per Second)
- V Velocity (Meter per Second)
- V_∞ Freestream Velocity (Meter per Second)
- V Distance of Point from Centroidal Axis (Meter)
- Y Specific Heat Ratio
- α Angle of Attack (Degree)
- θ Angle of Inclination (Degree)





- µ Coefficient of Force
- p Density of Material (Kilogram per Cubic Meter)
- **PFluid** Density of Fluid (Kilogram per Cubic Meter)





Constants, Functions, Measurements used

- Function: cos, cos(Angle)

 Trigonometric cosine function
- Function: cot, cot(Angle)

 Trigonometric cotangent function
- Function: sin, sin(Angle)

 Trigonometric sine function
- Measurement: Length in Meter (m)
 Length Unit Conversion
- Measurement: Area in Square Meter (m²)

 Area Unit Conversion
- Measurement: Pressure in Pascal (Pa)
 Pressure Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
 Speed Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion
- Measurement: Angle in Degree (°)
 Angle Unit Conversion
- Measurement: Mass Flux in Kilogram per Second per Square Meter (kg/s/m²)
 - Mass Flux Unit Conversion
- Measurement: Density in Kilogram per Cubic Meter (kg/m³)
 Density Unit Conversion





Check other formula lists

- Approximate Methods of Hypersonic Inviscid Flowfields Formulas
- Basic Aspects, Boundary Layer Results, and Aerodynamic Heating of Viscous Flow Formulas
- Blast Wave Part Theory
 Formulas
- Boundary Layer Equations for Hypersonic Flow Formulas
- Computational Fluid Dynamic Solutions Formulas
- Elements of Kinetic Theory Formulas
- Exact Methods of Hypersonic Inviscid Flowfields Formulas

- Hypersonic Equivalence Principle and Blast-Wave Theory
 Formulas
- Hypersonic Flight Paths Velocity of Altitude Map Formulas
- Hypersonic Small Disturbance Equations Formulas
- Hypersonic Viscous Interactions
 Formulas
- Laminar Boundary Layer at Stagnation point on Blunt body Formulas
- Newtonian Flow Formulas
- Oblique Shock Relation
 Formulas
- Space-Marching Finite Difference Method: Additional Solutions of the Euler Equations Formulas

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