

CHAPTER 1

Density

MECHANICS

CHAPTER 1

Significant Figures: Addition

MECHANICS

CHAPTER 2

Average velocity

MECHANICS

CHAPTER 2

Instantaneous velocity

MECHANICS

CHAPTER 2

Instantaneous acceleration

MECHANICS

CHAPTER 1

Significant Figures: Multiplication

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CHAPTER 2

Displacement

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CHAPTER 2

Average speed

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CHAPTER 2

Average acceleration

MECHANICS

CHAPTER 2

Velocity as a function of time

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When multiplying several quantities, the number of significant figures in the final answer is the same as the number of significant figures in the quantity having the lowest number of significant figures. The same rule applies to division.

$$\rho \equiv \frac{m}{V}$$

$$\Delta x \equiv x_f - x_i$$

or

Displacement = area under the v_x - t graph

When numbers are added or subtracted, the number of decimal places in the result should equal the smallest number of decimal places of any term in the sum.

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

$$\bar{v}_x \equiv \frac{\Delta x}{\Delta t}$$

$$\bar{a}_x \equiv \frac{\Delta v_x}{\Delta t} = \frac{v_{xf} - v_{xi}}{t_f - t_i}$$

$$v_x \equiv \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

$$v_{xf} = v_{xi} + a_x t$$

(constant acceleration)

$$a_x \equiv \lim_{\Delta t \rightarrow 0} \frac{\Delta v_x}{\Delta t} = \frac{dv_x}{dt}$$

CHAPTER 2

Position as a function of velocity and time

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CHAPTER 2

Velocity as a function of position

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CHAPTER 3

Cartesian \implies Polar

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CHAPTER 3

Vector quantity

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CHAPTER 4

Position vector as a function of time

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CHAPTER 2

Position as a function of time

MECHANICS

CHAPTER 3

Polar \implies Cartesian

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CHAPTER 3

Scalar quantity

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CHAPTER 4

Velocity vector as a function of time

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CHAPTER 4

Centripetal acceleration

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$$x_f = x_i + v_{xi}t + \frac{1}{2}a_x t$$

(constant acceleration)

$$x_f = x_i + \frac{1}{2}(v_{xi} + v_{xf})t$$

(constant acceleration)

$$x = r \cos \theta$$

$$y = r \sin \theta$$

$$v_{xf}^2 = v_{xi}^2 + 2a_x(x_f - x_i)$$

(constant acceleration)

A value with magnitude only and **no** associated direction

$$r = \sqrt{x^2 + y^2}$$

$$\tan \theta = \frac{y}{x}$$

$$\mathbf{v}_f = \mathbf{v}_i + \mathbf{a}t$$

A value that has both magnitude and direction

$$a_c = \frac{v^2}{r}$$

$$\mathbf{r}_f = \mathbf{r}_i + \mathbf{v}_i t + \frac{1}{2}\mathbf{a}t^2$$

CHAPTER 4

Period of circular motion

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CHAPTER 4

Total acceleration

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Galilean Transformation

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CHAPTER 5

Newton's First Law

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CHAPTER 5

Newton's Second Law

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CHAPTER 5

Newton's Third Law

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CHAPTER 6

Force causing centripetal acceleration

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CHAPTER 6

Nonuniform circular motion

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CHAPTER 7

Scalar, dot or inner product

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CHAPTER 7

Work done by a constant force

MECHANICS

$$\mathbf{a} = \mathbf{a}_t + \mathbf{a}_r = \frac{d|\mathbf{v}|}{dt}\hat{\theta} - \frac{v^2}{r}\hat{\mathbf{r}}$$

$$T \equiv \frac{2\pi r}{v}$$

In the absence of external forces, when viewed from an inertial reference frame, an object at rest remains at rest and an object in motion continues in motion with a constant velocity (that is, with a constant speed in a straight line).

When no force acts on an object, the acceleration of the object is zero

$$\begin{aligned}\mathbf{r}' &= \mathbf{r} - \mathbf{v}_0 t \\ \mathbf{v}' &= \mathbf{v} - \mathbf{v}_0\end{aligned}$$

If two objects interact, the force \mathbf{F}_{12} exerted by object 1 on object 2 is equal in magnitude and opposite in direction to the force \mathbf{F}_{21} exerted by object 2 on object 1:

$$\mathbf{F}_{12} = -\mathbf{F}_{21}$$

When viewed from an inertial reference frame, the acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass.

$$\sum \mathbf{F} = m\mathbf{a}$$

$$\sum \mathbf{F} = \sum \mathbf{F}_r + \sum \mathbf{F}_t$$

$$\sum \mathbf{F} = ma_c = m\frac{v^2}{r}$$

$$W \equiv F\Delta r \cos \theta$$

$$\mathbf{A} \cdot \mathbf{B} = AB \cos \theta$$

$$\mathbf{A} \cdot \mathbf{B} = A_x B_x + A_y B_y + A_z B_z$$

Work done by a varying force

Spring force

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$$F_s = -kx$$

$$W = \int_{x_i}^{x_f} F_x dx$$