Chapter 1 *Density* Mechanics	Chapter 1 *Significant Figures: Multiplication* Mechanics
Chapter 1 *Significant Figures: Addition* Mechanics	Chapter 2 *Displacement* Mechanics
Chapter 2 *Average velocity* Mechanics	Chapter 2 *Average speed* Mechanics
Chapter 2 *Instantaneous velocity* Mechanics	Chapter 2 *Average acceleration* Mechanics
Chapter 2 *Instantaneous acceleration* Mechanics	Chapter 2 *Velocity as a function of time* Mechanics

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.

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

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

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

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

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

(constant acceleration)

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

Chapter 2

Position as a function of velocity and time

Mechanics

Chapter 2

Position as a function of time

Mechanics

Chapter 2

Velocity as a function of position

Mechanics

Chapter 3

Polar $\Longrightarrow$ *Cartesian*

Mechanics

Chapter 3

Cartesian $\Longrightarrow$ *Polar*

Mechanics

Chapter 3

Scalar quantity

Mechanics

Chapter 3

Vector quantity

Mechanics

Chapter 4

Velocity vector as a function of time

Mechanics

Chapter 4

Position vector as a function of time

Mechanics

Chapter 4

Centripetal acceleration

Mechanics

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

(constant acceleration)

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

(constant acceleration)

$$\begin{aligned} x &= r\cos\theta \\ y &= r\sin\theta \end{aligned}$$

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

(constant acceleration)

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

$$\begin{aligned} r &= \sqrt{x^2 + y^2} \\ \tan\theta &= \frac{y}{x} \end{aligned}$$

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

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* Mechanics	Chapter 4 *Total acceleration* Mechanics
Chapter 4 *Galilean Transformation* Mechanics	Chapter 5 *Newton's First Law* Mechanics
Chapter 5 *Newton's Second Law* Mechanics	Chapter 5 *Newton's Third Law* Mechanics
Chapter 6 *Force causing centripetal acceleration* Mechanics	Chapter 6 *Nonuniform circular motion* Mechanics
Chapter 7 *Scalar, dot or inner product* Mechanics	Chapter 7 *Work done by a constant force* Mechanics

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

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

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 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.

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

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

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

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

$$\begin{aligned} \mathbf{A} \cdot \mathbf{B} &= AB\cos\theta \\ \mathbf{A} \cdot \mathbf{B} &= A_x B_x + A_y B_y + A_z B_z \end{aligned}$$

Chapter 7

Work done by a varying force

Mechanics

Chapter 7

Spring force

Mechanics

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