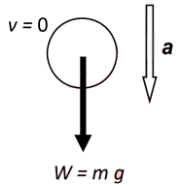
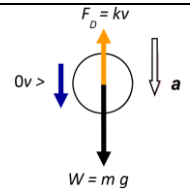
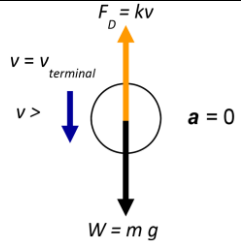
Rectilinear Motion (1-D motion) Graphs:

Remember to assign a reference positive direction and be constant throughout.

Types of Graphs	Gradient represents	Area Under Graph represents
Displacement - Time	$velocity = \frac{ds}{dt}$	-
Velocity - Time	$acceleration = \frac{dv}{dt}$	Displacement
Acceleration - Time	-	Change in velocity

Motion of object falling in a uniform g-field with air resistance:

Time	Forces acting on object	Motion of object
$t = 0s$		• Initial velocity is zero • Only force acting on object is its weight • $Acceleration = g$
$t = t1$		• As object velocity increases, the drag force (due to air resistance increases from zero. • $F_{net} = mg - F_D$ • $Acceleration < g$
$t = t2$		• When $F_D = mg$, resultant force on object is zero. • $Acceleration = 0$ • Object falls with max. constant velocity, called **Terminal Velocity**

Definitions:

Displacement: is the distance travelled in a stated direction from a reference point. (Vector)

Velocity: is the rate of change of displacement with respect to time. (Vector)

Acceleration: is the rate of change of velocity with respect to time. (Vector)

Speed: is the rate of change of distance travelled with respect to time. (Scalar)

Equations of Motion: only apply for uniform acceleration in a straight line.

1) $v = u + at$

2) $s = ut + \frac{1}{2}at^2$ → Derived using **area under Velocity-Time graph and Equation (1)**

3) $v^2 = u^2 + 2as$ → Derived using **Equation (1) and (2)**

Above equations are used in a **uniform gravitational** field without **air resistance.**

Projectile Motion (Non-linear motion):

Horizontal Motion:	Vertical Motion:
• Velocity constant, Acceleration is 0	• Acceleration is constant