

Equation Sheet for Exam 1

- Constant acceleration

$$v = at \quad \text{or} \quad v = v_0 + at$$

$$D = \frac{1}{2}at^2 \quad \text{or} \quad D = v_0t + \frac{1}{2}at^2$$

For free fall : distance fallen = $\frac{1}{2}gt^2$.

- Momentum : The definition of momentum is $p = mv$.

- Circular motion

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

- Gravity

$$W = mg$$

$$F = \frac{GM_1M_2}{r^2}$$

- Newton's second law

$$F = ma \quad \text{where} \quad a = \frac{\Delta v}{\Delta t} \quad \text{or} \quad a = \frac{2 \Delta x}{(\Delta t)^2}$$
$$\left[\Delta v = a \Delta t \right] \quad \left[\Delta x = \frac{1}{2}a(\Delta t)^2 \right]$$

- Orbits of the planets

$$T^2 \propto a^3 \quad \text{arbitrary units}$$

$$T^2 = a^3 \quad (\text{period in y; semi - major axis in AU})$$

- Newton's equation of motion ($ma = F$) for a planet in a circular orbit

$$\frac{mv^2}{r} = \frac{GMm}{r^2}$$

- Gravitational constants

$$g = 9.81 \text{ m/s}^2$$

$$G = 6.67 \times 10^{-11} \text{ m}^3 \text{ s}^{-2} \text{ kg}^{-1}$$