

University Physics 1 and 1A (Winter 2010-2)

Equation Sheet for Exam 3 or Final

Equations

$$x = x_o + v_{ox}t + \frac{1}{2}a_x t^2$$

$$v_x = v_{ox} + a_x t$$

$$v_x^2 = v_{ox}^2 + 2a_x(x - x_o)$$

$$x - x_o = \frac{1}{2}(v_{ox} + v_x)t$$

$$a_{centripetal} = \frac{v^2}{r}$$

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

$$f_s \leq \mu_s |\vec{N}|$$

$$f_k = \mu_k |\vec{N}|$$

$$W = \int \vec{F} \cdot d\vec{x}, \quad \text{for constant force } W = \vec{F} \cdot \vec{d}$$

$$U_{grav} = mgh$$

$$U_{spring} = \frac{1}{2}kx^2$$

$$K = \frac{1}{2}mv^2$$

$$E = U_{grav} + U_{spring} + K$$

$$E_{final} = E_{init} + W_{non-cons}$$

$$\vec{r}_{com} = \frac{\sum \vec{r}_i m_i}{\sum m_i}$$

$$\vec{p} = m\vec{v}$$

$$\vec{J} = \int \vec{F} dt = \vec{F} \Delta t = \Delta \vec{p}$$

$$\vec{F} = \frac{GMm}{r^2}(-\hat{r})$$

$$U_g = -\frac{GMm}{r}$$

Math

$$\vec{A} \cdot \vec{B} = |\vec{A}| |\vec{B}| \cos \theta = A_x B_x + A_y B_y + A_z B_z$$

$$\int x^m dx = \frac{x^{m+1}}{m+1} + C$$

$$\frac{dx^m}{dx} = mx^{m-1}$$

Quadratic equation:

$$0 = ax^2 + bx + c \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Uncertainties

Addition or Subtraction:

$$\text{For } Q = x + y - z + C_1$$

$$\Delta Q = \Delta x + \Delta y + \Delta z$$

Multiplication or Division: For $Q = C_1 xy/z$

$$\frac{\Delta Q}{Q} = \frac{\Delta x}{x} + \frac{\Delta y}{y} + \frac{\Delta z}{z}$$

Powers: For $Q = C_1 x^m y^n$

$$\frac{\Delta Q}{Q} = |m| \frac{\Delta x}{x} + |n| \frac{\Delta y}{y}$$

For other functions, follow the general rule—pick values to make Q as large as possible then subtract the average value of Q .

Units and Constants

$$g = 9.8 \text{ m/s}^2 = 32 \text{ ft/s}^2$$

$$1 \text{ mile} = 1609 \text{ m}$$

$$1 \text{ inch} = 2.54 \text{ cm}$$

$$1 \text{ metric ton} = 1000 \text{ kg}$$

$$G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$$