APPENDIX D Equations

Equations

Chapter 2 Motion in One Dimension

DISPLACEMENT	$\Delta x = x_f - x_i$
AVERAGE VELOCITY	$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$
AVERAGE SPEED	$\text{average speed} = \frac{\text{distance traveled}}{\text{time of travel}}$
AVERAGE ACCELERATION	$a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$
DISPLACEMENT *These equations are valid only for constantly accelerated, straight-line motion.*	$\Delta x = \frac{1}{2}(v_i + v_f)\Delta t$ $\Delta x = v_i \Delta t + \frac{1}{2}a(\Delta t)^2$
FINAL VELOCITY *These equations are valid only for constantly accelerated, straight-line motion.*	$v_f = v_i + a\Delta t$ $v_f^2 = v_i^2 + 2a\Delta x$

Chapter 3 Two-Dimensional Motion and Vectors

PYTHAGOREAN THEOREM *This equation is valid only for right triangles.*	$c^2 = a^2 + b^2$
TANGENT, SINE, AND COSINE FUNCTIONS *These equations are valid only for right triangles.*	$\tan\theta = \frac{\text{opp}}{\text{adj}}$ $\sin\theta = \frac{\text{opp}}{\text{hyp}}$ $\cos\theta = \frac{\text{adj}}{\text{hyp}}$
VERTICAL MOTION OF A PROJECTILE THAT FALLS FROM REST *These equations assume that air resistance is negligible, and apply only when the initial vertical velocity is zero. On Earth's surface, $a_y = -g = -9.81\ m/s^2$.*	$v_{y,f} = a_y\Delta t$ $v_{y,f}^2 = 2a_y\Delta y$ $\Delta y = \frac{1}{2}a_y(\Delta t)^2$
HORIZONTAL MOTION OF A PROJECTILE *These equations assume that air resistance is negligible.*	$v_x = v_{x,i} = \text{constant}$ $\Delta x = v_x \Delta t$