Useful Formulas - Exam II

Motion definitions

displacement:	$\Delta\mathbf{r} \equiv \mathbf{r}_f - \mathbf{r}_i$	
velocity:	average, $\bar{\mathbf{v}} \equiv \frac{\Delta\mathbf{r}}{\Delta t}$	instantaneous, $\mathbf{v} \equiv \frac{d\mathbf{r}}{dt}$
acceleration:	average, $\bar{\mathbf{a}} \equiv \frac{\Delta\mathbf{v}}{\Delta t}$	instantaneous, $\mathbf{a} \equiv \frac{d\mathbf{v}}{dt}$
radial acceleration:	$a_r = \frac{v^2}{r}$	
tangential acceleration:	$a_t = \frac{d\lvert\mathbf{v}\rvert}{dt}$	

Kinematic equations (**a** is constant)

$\mathbf{v}_f = \mathbf{v}_i + \mathbf{a}\,t$ $\qquad$ $v_f^2 = v_i^2 + 2\,\mathbf{a}\cdot\mathbf{r}$

$\mathbf{r}_f = \mathbf{r}_i + \mathbf{v}_0\,t + \frac{1}{2}\mathbf{a}\,t^2$ $\qquad$ $\mathbf{r}_f = \mathbf{r}_i + \frac{1}{2}(\mathbf{v}_i + \mathbf{v}_f)\,t$

Trigonometric formulas

$\sin(\theta) = \frac{opp}{hyp}$ $\qquad$ Law of sines: $\frac{\sin(\alpha)}{a} = \frac{\sin(\beta)}{b} = \frac{\sin(\gamma)}{c}$

$\cos(\theta) = \frac{adj}{hyp}$ $\qquad$ Law of cosines: $c^2 = a^2 + b^2 - 2\,a\,b\cos(\gamma)$

$\tan(\theta) = \frac{opp}{adj}$

Identities

$\sin^2(\theta) + \cos^2(\theta) = 1$ $\qquad$ $\sin(A \pm B) = \sin(A)\cos(B) \pm \cos(A)\sin(B)$

$\sin(2\theta) = 2\sin(\theta)\cos(\theta)$ $\qquad$ $\cos(A \pm B) = \cos(A)\cos(B) \mp \sin(A)\sin(B)$

$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)$