Physics 200B
Exam 4 review *DRAFT*

Wednesday, December 10, during regular class time
New sections: 11.1-11.4, 12.1-12.4, 13.1-13.2, 13.5-13.6, 15.1-15.5, 16.1-16.4, 18.1-18.3

Expect problems and questions similar in form to lab homework, concept questions, quiz questions, and text problems. There will be about 3 pages of problems and 1 page of short answer/choose the best answer/fill in the blank questions. Problems and questions will emphasize concepts and techniques covered in class, but applied to new situations.

$v_{xf} = v_{xi} + a_x t$

$x_f - x_i = \bar{v}_x t = \frac{1}{2}(v_{xi} + v_{xf})t$

$x_f - x_i = v_{xi} t + \frac{1}{2} a_x t^2$

$v_{xf}{}^2 = v_{xi}{}^2 + 2a_x(x_f - x_i)$

$a_c = v^2/r$ $\qquad \vec{\boldsymbol{u}}_{PA} = \vec{\boldsymbol{u}}_{PB} + \vec{\boldsymbol{v}}_{BA}$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\sum \mathbf{F} = m\mathbf{a}$ $\qquad f_s \le \mu_s n$ $\qquad f_k = \mu_k n$

$W = F\Delta r \cos\theta = \int F_x \, dx$ $\qquad \mathbf{F}_s = -k\mathbf{x}$ $\qquad W_s = \frac{1}{2}kx_i^2 - \frac{1}{2}kx_f^2$

$K \equiv \frac{1}{2}mv^2$ $\qquad W_{net} = K_f - K_i$

$U_g = mgy$ $\qquad U_s = \frac{1}{2} kx^2$

$\Delta K + \Delta U + \Delta E_{int} = W + Q + T$

$K_f + U_f = K_i + U_i$ $\qquad \Delta E_{int} = f_k d$

$P = \frac{dE}{dt} = Fv$ $\qquad P_{avg} = \frac{\Delta E}{\Delta t}$

$\vec{p} = m\vec{v}$ $\qquad \sum \vec{p_i} = \sum \vec{p_f}$ $\qquad \vec{I} = \int_{t_i}^{t_f} \sum \vec{F} \, dt = (\sum F)_{avg} \Delta t$ $\qquad \Delta\vec{p} = \vec{I}$

$v_{1i} - v_{2i} = -(v_{1f} - v_{2f})$

$x_{cm} = \frac{\sum m_i x_i}{M}$ $\qquad y_{cm} = \frac{\sum m_i y_i}{M}$

$\omega_f = \omega_i + \alpha t$

$\theta_f - \theta_i = \frac{1}{2}(\omega_i + \omega_f)t$

$\theta_f - \theta_i = \omega_i t + \frac{1}{2}\alpha t^2$

$\omega_f{}^2 = \omega_i^2 + 2\alpha(\theta_f - \theta_i)$

$s = r\theta$ $v = r\omega$ $a_t = r\alpha$ $I = \sum m_i r_i^2$ $K_R = \frac{1}{2}I\omega^2$ $I = I_{CM} + MD^2$

$\tau = rF\sin\varphi = Fd$ $\sum\tau = I\alpha$ $K = \frac{1}{2}I_{CM}\omega^2 + \frac{1}{2}mv_{CM}^2$ $v_{CM} = R\omega$ $a_{CM} = R\alpha$

$|\vec{A}\times\vec{B}| = AB\sin\theta$ $\vec{A}\cdot\vec{B} = AB\cos\theta$

$\vec{L} = \vec{r}\times\vec{p}$ $L = mvr\sin\varphi = mvd$ $L = I\omega$

$\sum\mathbf{F} = 0, \sum\tau = 0$ $Y = \frac{F/A}{\Delta L/L_i}$

$F = G\frac{m_1 m_2}{r^2}$ $U = -G\frac{m_1 m_2}{r}$ $E = -G\frac{m_1 m_2}{2r}$

$x(t) = A\cos(\omega t + \varphi)$ $v(t) = -\omega A\sin(\omega t + \varphi)$ $a(t) = -\omega^2 A\cos(\omega t + \varphi)$

$\omega = \sqrt{\frac{k}{m}}$ $T = \frac{2\pi}{\omega} = \frac{1}{f}$ $E = \frac{1}{2}kA^2$ $v_{max} = \omega A$ $a_{max} = \omega^2 A$

$\omega = \sqrt{\frac{g}{L}}$ $\omega = \sqrt{\frac{mgd}{I}}$

$y(x,t) = A\sin\left(\frac{2\pi}{\lambda}(x \pm vt)\right) = A\sin(kx \pm \omega t)$ $k = \frac{2\pi}{\lambda}$ $v = \frac{\lambda}{T} = \lambda f$

$v = \sqrt{\frac{T}{\mu}}$ $y = 2A\sin kx\cos\omega t$ $f_1 = \frac{v}{2L}$

Other information that will be provided:

- Conversion factors (table inside back cover of book)
- Any constants or physical data needed for a particular problem (such as the radius of the Earth, mass of an electron, etc.)
- Table 10.2

You should know, understand, and be able to use the definitions of average and instantaneous velocity and acceleration (for translational motion as well as for rotational motion).
You should be able to use trig functions and the Pythagorean theorem to find missing sides and angles of a right triangle. (You do not need to know the law of cosines or the law of sines.)
You should also know what the metric prefixes μ, m, c, and k stand for!