Physics 2305 12 April, 2000
Study Guide for Exam 3

Exam 3 will cover Chapters 16, 14, 15, and 19 of the textbook. It will consist of approximately 8-10 multiple-choice questions and 2-3 free-form questions.

To review, go back over the summary sections at the end of each chapter, all sample problems done in class or in the text, all assigned homework problems, and any quizzes given. The list below gives important equations and concepts to understand. Remember that this course is not about memorizing equations, it's about understanding the concepts behind the equations and how to apply them.

Chapter 16

$T = 2\pi/\omega = 1/f$ Relations of period and frequency

$T = 2\pi \, (m/k)^{1/2}$ Spring

$T = 2\pi \, (I/\kappa)^{1/2}$ Torsion pendulum

$T = 2\pi \, (L/g)^{1/2}$ Simple pendulum

$T = 2\pi \, (I/mgh)^{1/2}$ Physical pendulum

You should be able to recognize when a differential equation has a solution of the form $x(t) = \cos(\omega t + \phi)$.

The damped oscillator will not be on the exam.

Chapter 14

$F = G \, m_1 m_2 \, / \, r^2$ Universal Law of Gravitation

$U = - \, G \, m_1 m_2 \, / \, r$ Gravitational potential energy

$v_e = (2 \, GM/R)^{1/2}$ Escape velocity

You should be able to derive the formula for escape velocity and be able to use it to find the Schwarzschild radius (radius of event horizon) for a black hole.

You should know Kepler's Laws and be able to derive the third one (in simple form) from the Law of Universal Gravitation and the definition of centripetal acceleration.

Chapter 14 continued

$T^2 = (4\pi^2/G)\ a^3\ /\ (m_1 + m_2)$ 　　　　Newton's Form of Kepler's Third Law

Satellites and the energy of orbits will not be on the exam.

Chapter 15

$p = F/A$ 　　　　　　　　　　Pressure and force

$p_2 = p_1 + \rho\ g\ \Delta y$ 　　　　　　Pressure and depth

You should also know:
    - the difference between absolute and gauge pressure
    - Pascal's Principle and its application to the hydraulic lever

$F_b = \rho_d\ V_d\ g$ 　　　　　　　　Archimedes' Principle
    = weight of displaced fluid

$R = Av = \Delta V/\Delta t = \text{constant}$ 　　　Equation of Continuity

$p + \frac{1}{2}\rho v^2 + \rho g y = \text{constant}$ 　　　Bernoulli's Equation

Chapter 19

$T_F = (9/5)\ T_C + 32°$ 　　　　　Celsius to Fahrenheit conversion

$\Delta L = L\ \alpha\ \Delta T$ 　　　　　　　Linear expansion

$\Delta V = V\ \beta\ \Delta T$ 　　　　　　　Volume expansion

$Q = cm\ (T_f - T_i)$ 　　　　　　Specific heat

$Q = Lm$ 　　　　　　　　　　Heat of transformation

$H = Q/t = (A/\Sigma R)\ (T_H - T_C)$ 　　Rate of heat flow across a conducting layer

$R = L/k$ 　　　　　　　　　　Thermal resistance

$P = A\varepsilon\sigma T^4$ 　　　　　　　　Radiated or absorbed power
    (T can be for the object or its environment)

The discussion about measuring temperature will not be on the exam.

That seems like plenty for one exam. Good luck preparing!