Answers to exams given by Professor Mallinckrodt
Physics 132—Spring 2002

Midterm

1. i) kg/m, M/L, ii) rad/s, 1/T, iii) W, ML^2/T^3

2. $M = \dfrac{gR^2}{G} = 6.0 \times 10^{24}$ kg

3. a) ~28 ms

4. a) 31.4 rad/s b) 15.9 cm

5. b) 48 cm

6. b) $v_{thin} = 2v_{thick}$ c) 188 ms d) 100 Hz, 80 cm EC) 312 g

7. b) $F_{\text{net}} = \dfrac{5GM^2}{4R^2}$ c) $T = 4\pi\sqrt{\dfrac{R^3}{5GM}}$ d) Should be a little shorter. (In fact T = 327 days.)

Final Exam

1. a) 1.48 s b) 58.9 cm

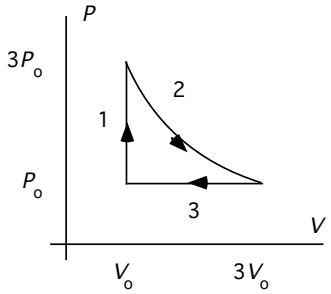
   c) Oscillator has half the initial kinetic energy. Mechanical energy is lost in the inelastic collision.

2. $F_{\text{net}} = \dfrac{3GM^2}{R^2}$ b) $T = 2\pi\sqrt{\dfrac{2R^3}{3GM}}$

3. a) 12.0 m/s b) -32.8 kPa c) Lower

4. a) See at right b) See below

Leg	Q	W	ΔE
1	$5P_oV_o$	0	$5P_oV_o$
2	$3\ln3P_oV_o$	$-3\ln3P_oV_o$	0
3	$-7P_oV_o$	$2P_oV_o$	$-5P_oV_o$



   c) $e = \dfrac{3\ln 3 - 2}{3\ln 3 + 5} = 15.6\%$

5. a) 1.48 W b) 2.0 m

   EC) The answer would still have to be 2.00 m but that is not possible because with a wavelength of 2.00 m *both* positions are an odd multiple of half wavelengths away from *both* sources and the waves will, therefore, necessarily interfere constructively.