

Problem T1			10 Points total		
A1			3.0		
(SOLN1)	Forces correctly: Weight,	0.2			
	Forces correctly: Buoyancy	0.2			
	Forces correctly: Pressure difference	0.2			
	Pressure force: P times area	0.4			
	Torques applied correctly (wrt to O and correct arms)	0.6			
	Understands critical vanishing condition	0.5			
***** Notice below****	Correctly evaluates height	0.7			
	Units are used correctly	0.2			
*****	If height wrong numerically, by small algebra mistake only	0.3			
B1			1.0		
(SOLN1)	Writes correct energy equation and calculates it	0.3			
	Writes condition for critical point correctly	0.3			
	Chooses correct solution numerically	0.2			
	Units of a_0 correctly	0.2			
(SOLN2)	Writes correct energy equation and calculates it	0.3			
	Notifies that one is at one of the turning points	0.15			
	Computes a (in the hint equation we give them)	0.15			
	Chooses correct solution numerically	0.2			
	Units of a_0 correctly	0.2			
(SOLN3)	Writes correct energy equation and calculates it	0.3			
	Notifies that one is at one of the turning points	0.15			
	Computes semi-major axis	0.15			
	Chooses correct solution numerically	0.2			
	Units of a_0 correctly	0.2			
B2			2.5		
(SOLN 1)	Numerically tabulates the energy and finds it positive	0.8			
	Computes eccentricity correctly (needs to be >1)	0.8			
	Finds parameter a correctly	0.4			
	Finds angle correctly (denominator vanishing)	0.5			
C1	Momentum conservation correct	0.2	2.5		
(SOLN1: pure algebra)	Energy conservation correct	0.2			

[illegible]

PROBLEM T2

10 Points total

A			1.5		
	Correctly identifies critical conditions	1.0			
	Does algebra correctly (has correct expression in terms of R,n)	0.5			
Partial soln	Critical condition only for 1 reflections	0.3			
	Critical condition only for 2 and 3 reflections	0.6			
	Critical condition only for 2 and 3 and 4 reflections	1.0			
B1			2.0		
	Correctly understand angles of reflection	0.3			
	Correctly understands relation to geometry of container center line	0.5			
	Correctly understands tangential condition	0.2			
	Use triangles in image to compute,	0.5			
	Do trigonometric correctly	0.5			
B2			1.5		
	Correctly computes P0	0.3			
	Understands flux flow	0.7			
	Correctly computes P	0.3			
	Expressed correctly in terms of required data	0.2			
B3			0.5		
	Utilize previous result correctly to compute theta_max	0.3			
	Calculate a for specific case	0.15			
	correct units	0.05			
C1			0.5		
	Slope correct	0.3			
	Intercept correct	0.2			
C2			2.0		
	Do second slope correctly with small increment in angle	0.2			
	Correctly expand slope to first order	0.8			

[illegible]

PROBLEM T3

10 Points total

A1			0.2		
	Correctly uses Ampere circuital law	0.1			
	Writes correctly in terms of required variables	0.1			
A2	Recognize EMF are opposite (no resistance)	0.2	0.6		
	Correctly uses Faraday law	0.3			
	Correct expression for work	0.1			
ALT:	IF STUDENT KNOWS ANSWER ALREADY HdB	0.6			
A3	Differentiate relation	0.1	0.2		
	Substitute and get correct answer	0.1			
B1	Correctly states energy conservation with heat	0.3	1.5		
	Recognize that at constant M the internal energy depends only on T	0.3			
	Correctly understand isothermal relation between heat and magnetization	0.3			
	Relate heat to change in H	0.2			
	Correctly get Q	0.4			
B2	Correctly understand adiabatic process (no heat exchange)	0.5	1.5		
	Correctly get differential relation between dT and dM	0.3			
	Separate variables correctly	0.1			
	Integrate correctly	0.3			
	Algebra done correctly	0.3			
C1	Correctly label temperatures on graph	0.1	0.2		
	Specify heat flow portions in diagram	0.1			
C2	Correctly use conservation of energy (from previous work) to find heat with correct sign (0.2 each)	0.4	1.5		
	Identify correctly the temperatures of the vertices (0.1 each)	0.4			
	Use Carnot's relation to set up algebra	0.3			
	Simplify using equation of state	0.3			
	Get to correct final expression	0.1			

