

MATH 162Q, Quest Calculus IIA

Workshop #3

Due Wednesday October 7, 2009

Group members are required to write up solutions individually. It is important that you write up solutions in your own words. You should explain not only what, but also why you decided to do what you did. You should think of this as an opportunity to reflect on the process that will lead you to a correct solution to similar problems.

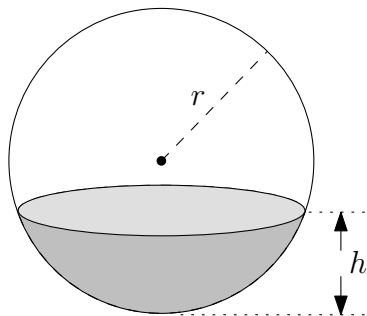
Please use this as a cover sheet to your workshop writeup. Make sure all work is stapled and turn it into the professor before class on the due date.

NAME: _____

Please list all your group members, and on a scale from **1 (low)** - **5 (high)** rank your and their participation in the workshop. This will not affect grades, rather, it will supply the professor and TA with workshop feedback.

Group Member	Participation

Problem 1.



Show that the volume of a segment of height h of a sphere of radius r is

$$V = \frac{1}{3}\pi h^2(3r - h).$$

Problem 2. A leaky 10 kg bucket is lifted from the ground to a height of 12 m at a constant speed with a rope that weighs 0.8 kg/m. Initially the bucket contains 36 kg of water, but the water leaks at a constant rate and finishes draining just as the bucket reaches the 12 m level. How much work is done?

Problem 3. Find the result of the integral

$$\int_{-1}^1 \frac{\sin x}{1+x^2} dx$$

a) by directly evaluating, b) without evaluating.

Problem 4. If n is a positive integer, prove that

$$\int_0^1 (\ln x)^n dx = (-1)^n n!$$

where $n!$ (n factorial) is defined as $n! = n(n-1)(n-2)\cdots 3 \cdot 2 \cdot 1$.