Group Project Rules of Engagement

DUE DATES:

The group project is due to your instructor **by 1530, Friday 5 December, 2014 (M38)**. Late submissions will be handled in accordance with DFMS Policy.

EI POLICY:

You may receive EI from either the QRC or a DFMS instructor prior to **2200 on Thursday, 4 December, 2014**. Please keep in mind that receiving EI from your instructor depends on his or her availability, and waiting until the last minute to schedule EI significantly decreases your chances of receiving help. Team member attendance policies may be set at the discretion of your instructor.

You should schedule EI only after making a reasonable attempt to research the material on your own. The research and self-learning process is just as important as finding the solution.

AUTHORIZED RESOURCES:

Anyone and anything with the following exceptions/clarifications:

1. You may NOT receive help from cadets outside of your group regarding specific questions, and multiple groups may NOT jointly answer the questions.
2. Your group may not copy or paraphrase any part of the electronic work of any other person or group.
3. Your group must submit its own work, which must accurately reflect your group's understanding of the problem.
4. Your group members are responsible for their own efforts and must type their own work.

   Note: Remember, "Never copy verbatim the graded academic work of another cadet and submit it, even documented as such." (Honor Code Reference Handbook).

DOCUMENTATION:

All help received and all resources referenced must be properly documented (see the Dean's "Academics With Honor" letter and the "DFMS Documentation Policy Letter" on the Math 152 Course Website under "Academic Policies"). You do not need to document other members in your group.

GROUP STRUCTURE:

Your groups will have no more than 3 members. The group composition will be at the discretion of your instructor. You need to work as a group to accomplish this assignment. All members of the group are responsible for development of the solutions. Beware: without strong consolidation, the "divide and conquer" method generally produces a substandard final product.

GRADING:

The group project is worth 150 points. Your instructor will grade your project and give it a score out of 150 points. Each team member will receive the team score.

FORMAT:

Neatness and completeness are fundamental to developing a logical thought process and communicating in an organized manner. Your write up must be typed; this includes your mathematical solutions. Each problem will follow a logical flow (*e.g. Picture, Goal, Set Up, Work, and Conclusion*) with enough to fully explain your modeling approach, solution technique, and the actual answer. Your submission must be a stand-alone, coherently written, easy-to-follow, professional-looking, typed document that includes an introduction, body, and conclusion. Use appropriate technology to embed diagrams, tables, graphs, charts, and equations.

DELIVERABLE:

Provide a professionally formatted stand-alone report. There is a maximum page length of 5 pages for this assignment. You should not add unnecessary material to extend the length of your report.

EXTRA INSTRUCTION (E.I.):

E.I. from a Math 152 instructor or from the QRC will be conducted on a single group basis. The level of help will be limited to clarification, pointing out errors, interpretation of questions, and suggestions for approaches to a problem.

1. Find the line $y = mx$ that divides the area under the curve $y = x(1 - x)$ and above the x-axis into two regions of equal area.

2. A doughnut-shaped solid is called a torus (Figure 1 below). Use the washer method to calculate the volume of the torus obtained by rotating the region inside the circle with equation $(x - a)^2 + y^2 = b^2$ around the y-axis (assume that *a* > *b*). Please provide answers to steps a through c below.

    a. Draw a representative slice (washer) of the solid and find an expression for its volume.

    b. Set-up an integral that gives the volume of the solid. Algebraically simplify the integrand as far as possible.

    c. Evaluate the integral that gives the volume by interpreting the function being integrated as the area of a circle.

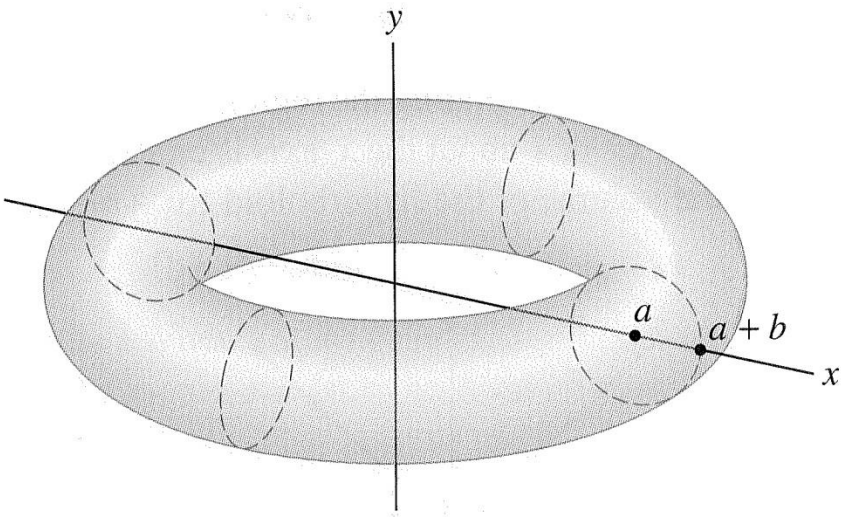

Figure 1

3. Calculate the hydrostatic force exerted on the "infinite" plate defined by the region below the x-axis and between the y-axis and the curve $y = \ln(x)$. Assume the water surface is along the line $y = 1\ m$. Assume the density of water is $1000\ {}^{kg}/_{m^3}$.

4. A conical tank filled with water has height 12 ft (Figure 2 below). Assume that the top is a circle of radius 4 ft and that water leaks through a hole in the bottom of area 2 in^2. Let $y(t)$ be the height of the water at time t. Read the Applied Project on pg. 603-604 from *Calculus Early Transcendentals; 7th Edition* and adapt Equation 1 and Part 4 to this problem to aid you in finding your solution. Please provide answers to parts a through c below.

   a. Find an expression to represent the cross-sectional area of the tank at height y.

   b. Find the differential equation satisfied by $y(t)$ and solve for $y(t)$. Use the initial condition $y(0) = 12$.

   c. How long does it take for the tank to empty?

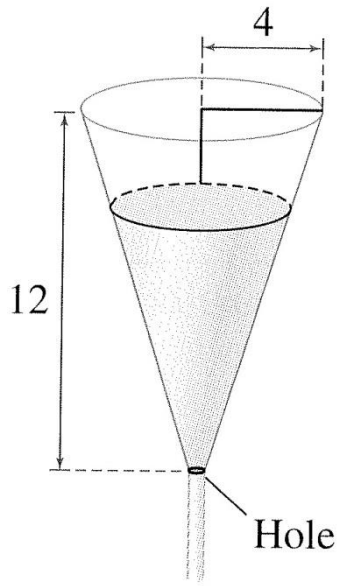

Figure 2

5. Using Simpson's Rule with $n = 10$, approximate the area of the surface obtained by rotating $y = x^{1/2} - \frac{1}{3}x^{3/2}$ about the x-axis for $1 \le x \le 3$. See Section 8.2, pg. 545 from *Calculus Early Transcendentals; 7th Edition*.