MATH 1352-002 Exam II June 22, 1999

Answer the problems on separate paper. You do not need to rewrite the problem statements on your answer sheets. Do your own work. Show all relevant steps which lead to your solutions. Retain this question sheet for your records.

1. Find the derivative of y with respect to x or t as appropriate. Simplify where appropriate.

   a. $y = x\sin^{-1}(x) - (1-x)\cos^{-1}(x) - \frac{\pi}{2}x$ b. $y = (1-x)\tanh^{-1}(\sqrt{x}) + \sqrt{x}$

2. Evaluate the following integrals.

   a. $\int \frac{1}{3+4x^2}\,dx$ b. $\int 6\sinh^2(2x)\,dx$

In problems 3-4, write down an integral to represent the solution of the stated problem. Do **NOT** evaluate the integral.

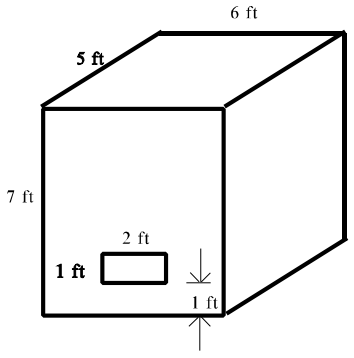
3. Find the area of the bounded region enclosed by the curves $y = \frac{x^3}{3} - x$ and $y = \frac{x}{3}$.

4. Let G be the region in the first quadrant which is bounded above by the curve $y = \frac{1}{\sqrt{x}}$, on the left by the line $x = ¼$ and below by the line $y = 1$. Find the volume of the solid of revolution determined by

   a. revolving G about the x-axis b. revolving G about the y-axis

   c. revolving G about the line $x = -2$

5. The rectangular tank shown here has a 1.00 ft x 2.00 ft rectangular window which is 1.00 ft above the base. The window is designed to withstand 375 lb without rupturing. (Take the weight density of water as 62.5 lbs/ft^3.) What fluid force will be exerted on the window if the tank is filled with water to a depth of 3.00 ft?



6. Evaluate the following integrals

   a. $\int \theta^2\cos(2\theta)\,d\theta$ b. $\int \frac{x^3+x^2}{x^2+x-2}\,dx$ c. $\int \frac{(1+2\ln x)(2-\ln x)}{2x\ln x}\,dx$

Bonus: (Due Wednesday.) Suppose in Problem 5 the window is circular (with radius 1.00 ft) rather than rectangular in shape and positioned with its center 2.00 ft above the base. How deep can the tank be filled without exceeding the window's design limitation (375 lbs rupture limitation)?