**MATH 162 Practice TEST 1A**

***1.*** Use integration by parts to evaluate the following integral:



***2.*** The base of a solid is the region enclosed by y = 1/x, y = 0, x = 1, and x = 4. Every cross section of the solid taken perpendicular to the x-axis is an isosceles right triangle with its hypotenuse across the base. Express the volume of the solid as a Riemann integral. (You need not evaluate your integral.)

***3.*** A cylindrical barrel, standing upright on its circular end, contains muddy water. The top of the barrel, which has a diameter of 3 feet, is open. The height of the barrel is 4 feet and it is ¾ filled with muddy water. The weight of the muddy water at a distance of *h* feet from the bottom of the barrel is given by w(h) = 51 + k(4-h) pounds/feet3, where *k* is a positive constant. Find the total work done in pumping the muddy water to the top rim of the barrel. (*Note:* Evaluate your integral. Your answer will include the constant *k*.)

***4.*** A snail crawls along the curve y = x3/2 at a speed of 3 feet per hour. How long does it take the snail to travel from the point (1, 1) to the point (4, 8)? Give a numerical answer.

***5*.** Using implicit differentiation, find a formula for the derivative of each of the following inverse functions:

(A) arcsinh x

(B) arccosh x

(C) arctanh x

***6.*** A cable that weighs 2 lb/ft is used to lift 800 lb of coal up a mineshaft 500 ft deep. Find the work done. Express your answer numerically.

***7.*** Consider the region, R, bounded by the curves y = ln x, y = 0, and x = 2. Suppose that R is rotated about the line x = -1. Express the volume of this solid of revolution as a Riemann integral using each of the following methods. Be certain to make a sketch for each.

1. cylindrical shells
2. washers

***8.*** The region in the first quadrant bounded by the curves

y = (1 + x)1/2, y = 0, x = 0, and x = 1

is rotated about the x-axis. Find the surface area of this solid of revolution. Express your answer numerically.

***9.*** Suppose that the volume of water required to fill a hollow object to a depth of *h* inches (where 0 ≤ h ≤/2) is given by the function:

*V(h) = 1.5h + sin h* cubic inches.

What is the cross-sectional area of the object 1 inch above its base?