Test #2 (Part 2, Scientific Calculator Okay) Name: _____

Math 181, Prof. Beydler Wednesday, October 24, 2018

Directions: Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, no smart watches, etc.). If you have a phone in your lap or on your chair, it is considered cheating, and you will receive a zero on this test. Write your answers in the indicated places, or box your answers. Good luck!

1. Consider the integral $\int_1^3 e^{-x}\,dx$.

Trapezoidal Rule: $\int_a^b f(x)\,dx \approx \frac{\Delta x}{2}[f(x_0) + 2f(x_1) + \cdots + 2f(x_{n-1}) + f(x_n)]$

$|E_T| \leq \frac{M(b-a)^3}{12n^2}$ (M is any upper bound of $|f''|$ on $[a, b]$, and n is # of subintervals)

a. (3 points) Use the Trapezoidal Rule with $n = 4$ steps to approximate the integral to 6 decimal places.

Answer: _____

b. (3 points) How large does n need to be to guarantee that the approximation from part (a) is accurate to within 0.00001?

$n =$ _____

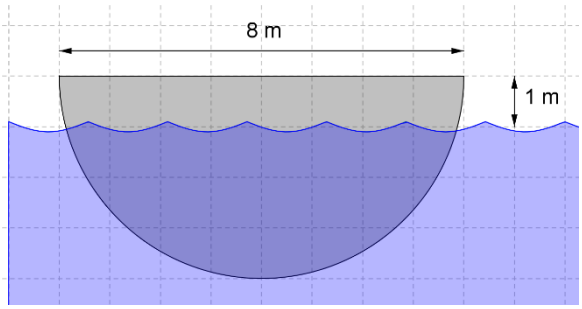
2. (5 points) Find the length of $x = \ln(\cos y)$ from $y = \frac{\pi}{6}$ to $y = \frac{\pi}{4}$.

Answer: _____

3. (5 points) Find the area of the surface generated by revolving the curve $y = 2\sqrt{x}$ from $x = 1$ to $x = 4$ about the x-axis.

Answer: _____

4. (4 points) A vertical plate in the shape of a semicircle is partially submerged in water as shown. **Set up (but do not evaluate) an integral** to find the exact hydrostatic force against one side of the plate. (Note: you can use 1000 kg/m^3 for the mass-density of water, and 9.8 m/s^2 for the acceleration due to gravity.)



Answer: _____

5. (5 points) Find the area of the region between enclosed by $x = y^2 - y$ and $x = y$. Then **set up (but do not evaluate) integrals** to find the x and y coordinates $(\bar{x}, \bar{y})$ of the centroid.

Area = _____

$\bar{x} =$ _____

$\bar{y} =$ _____

6. (6 points) A tank contains 100 gal of fresh water. A solution containing 0.02 kg of salt per gallon of water runs into the tank at a rate of 5 gal/min. The mixture is kept thoroughly mixed and is pumped out of the tank at a rate of 5 gal/min. How many kilograms of salt will be in the tank after 8 minutes?

Answer: _____

Here are a couple of formulas I promised to give you:

$$\int \sec x \, dx = \ln|\sec x + \tan x| + C$$
$$\int \csc x \, dx = -\ln|\csc x + \cot x| + C$$

Note: Be sure to double-check your work!