

Math 152
Final Exam
March 19th, 2010

Name: _____

1. Your exam contains 7 questions and 7 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values vary and these are indicated on each problem. You have 2 hours for this exam.
3. Make sure to **ALWAYS SHOW YOUR WORK**; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification.
4. Put a box around your final answer where applicable.
5. Leave answers in exact form (as simplified as possible).
6. You are allowed one 8.5" \times 11" noteshet (both sides).
7. You may use a calculator for this exam, but I will not give credit for work done solely on a calculator (aside from arithmetic).
8. If you need extra space, attach an extra sheet to the back of the exam and clearly indicate this.

Problem	Total Points	Score
1	15	
2	15	
3	11	
4	13	
5	18	
6	14	
7	14	
Total	100	

1. (15 pts.) Let R be the region enclosed by $y = e^{2x}$ and the x -axis from $x = 0$ to $x = 2$.

Find the volume of the solid obtained by revolving R about the line $y = -1$.

2. (15 pts.) Suppose a lake currently contains 2,000 fish and the fish population is increasing at a rate of $\frac{100}{1+\sqrt[3]{t+8}}$ fish per month, where t is the number of **months** from today.

According to this model, what will the fish population be 42 **years** from now? (Round your final answer to the nearest fish.)

3. (11 pts.) Set-up an integral to find the arc length of the curve $y = e^{4x} + 1$ from $x = 0$ to $x = 1$. Approximate the value of this integral using Simpson's Rule with $n = 4$. (Round your approximation to 4 decimal places.)

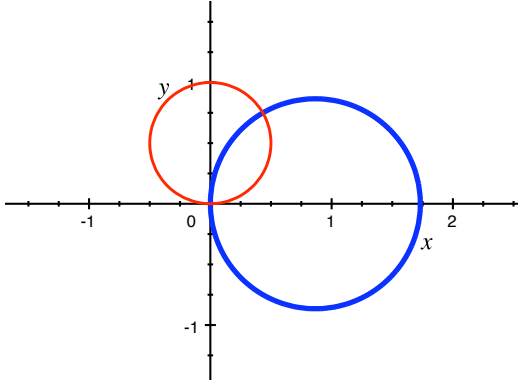
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4. (13 pts.) Solve the differential equation $\frac{dy}{dx} = \frac{x}{y(x^2+1)}$ with the initial condition $x = 0, y = 3$.

5. (18 pts.) Evaluate the following integrals. If the integral is improper, state whether it is convergent or divergent.

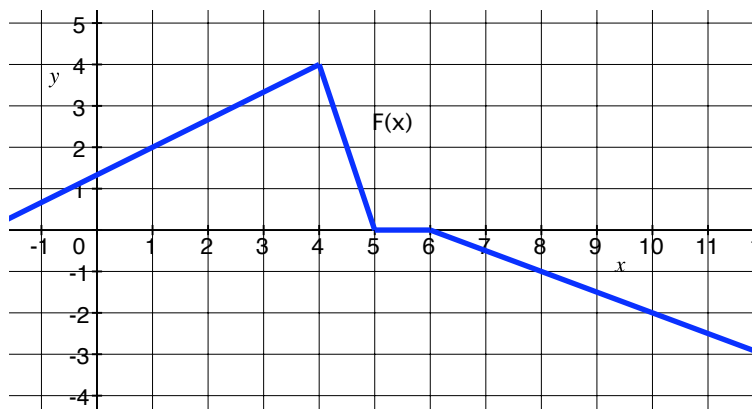
(a) (7 pts.) $\int \frac{t+3}{(t+2)(t+1)}$

(b) (11 pts.) $\int_1^{\infty} \frac{e^{1/x}}{x^3} dx$

6. (14 pts.) Find the area of the region that lies **inside both** polar curves $r = \sqrt{3} \cos \theta$ and $r = \sin \theta$.
(See figure below.)



7. (14 pts.) The graph of the function $F(x)$ is shown below.



(a) (6 pts.) Find the average value of $F(x)$ over the interval $[1,10]$.

(b) (4 pts.) Find the average rate of change of $F(x)$ over the interval $[1,10]$.

(c) (4 pts.) If $F(x) = \int_1^x f(t) dt$, sketch a graph of $f(x)$ below for $x > 1$.

