

Exam 1

February 6, 2009

Your Name: _____

There are 6 problems in this exam. On each problem, you must show all your work, or otherwise thoroughly explain your conclusions. **There is always at least one step preceding a final answer.** Units may be requested for your final answer; a point deduction will apply if they are omitted.

On the portion of the exam marked **NO CALCULATOR**, you will be allowed 20 minutes during which your calculator must be closed and put away. If you finish this section early, you may hand in your work early. However, **only after you hand in the "no calculators" section will you be permitted to use a calculator.**

You will have 55 minutes to complete this exam.

Question	Point Value	Your Score	
No Calc.	50		
1	30		
2	35		
3	35		
Total	150		

NO CALCULATOR PORTION

Math 106-C (Salomone)

Exam 1

Show all your work!

Name: _____

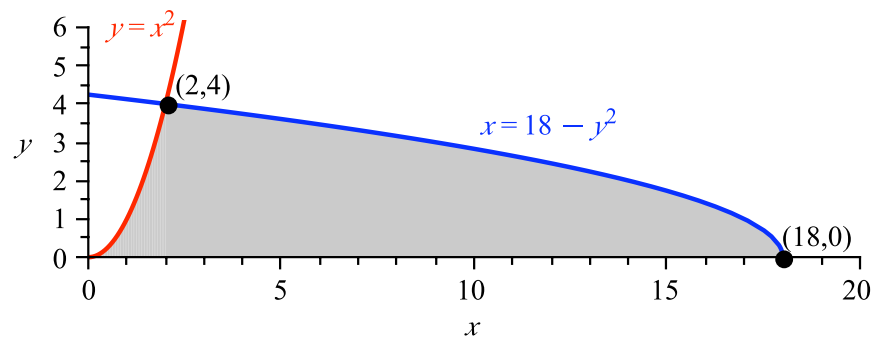
Score (50 possible):

Problem 1-NC. (20 points) Use the Fundamental Theorem of Calculus to evaluate the following integrals:

(a) (10 points) $\int \frac{1}{\sqrt{x}(5 + \sqrt{x})^2} dx$

(b) (10 points) $\int_0^1 e^{e^x+x} dx$

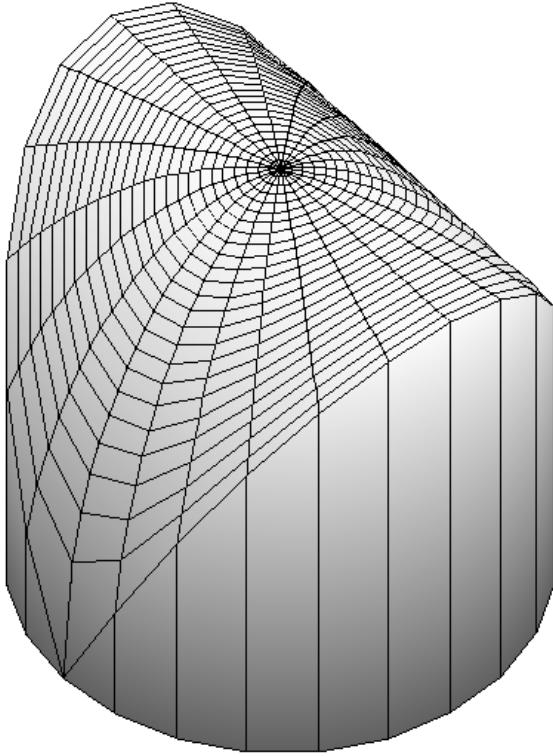
Questions 2 — 3 refer to the graph shown below.



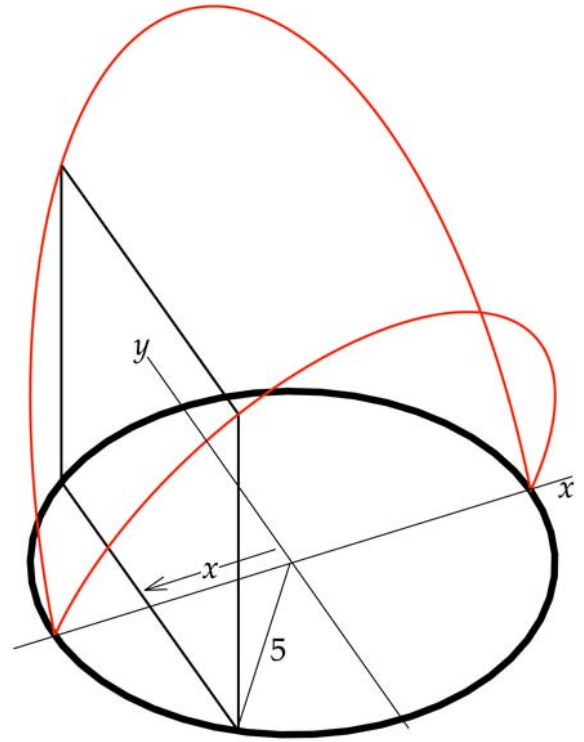
Problem 2-NC. (20 points) Compute the *exact area* of the shaded region.

Problem 3-NC. (10 points) SET UP — BUT DO NOT EVALUATE — an integral which computes the length of the curve shown above, whose endpoints are $(2, 4)$ and $(18, 0)$.

Problem 1. (30 points) You design a camping tent whose footprint is a 10-foot-diameter circle and whose carbon-fiber frame is designed of rigid squares.



The tent...

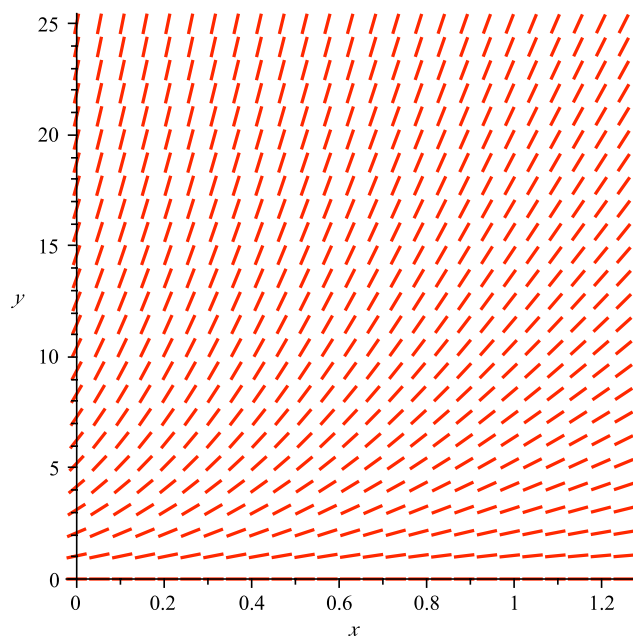


...and a view of its *square* cross sections.

Calculate the *exact volume* this tent encloses, in cubic feet.

Problem 2. (35 points) Consider the initial-value problem

$$\frac{dy}{dx} = \frac{4y}{1+x^2} \quad y(0) = 1.$$



(a) (15 points) Use Euler's method with step size $\Delta x = 0.25$ to approximate $y(1)$, and indicate what you've done on the slope field at left. Be sure to circle your final answer.

(b) (20 points) Use separation of variables to find the exact function which solves this IVP. How well does your answer to part (a) compare with the exact value of $y(1)$?



Problem 3. (35 points) As caddymaster of Vice City Country Club, you have just hired a caddy named Tommy whom you suspect of taking golf carts for late-night joyrides around the city.

Accordingly, you install a monitor on all your golf carts which secretly records the cart's speed s at 15-minute intervals during the night. You also install a governor on each engine which limits the cart to a speed of no more than 18 mph, and acceleration of no more than 24 mph/hr.

Sunday morning, the readout from one of the carts looks suspicious:

t (hr)	21	21.25	21.5	21.75	22	22.25	22.5	22.75	23
s (mph)	1.5	5.7	10.1	15.5	17.6	14.1	10.5	4.5	0

(a) (20 points) Use a right-hand sum R_8 to estimate how far Tommy drove the golf cart during his two-hour joyride.

(b) (15 points) If a golf cart is driven more than 25 miles in a day, the insurance company requires it be reclassified as a passenger car, and will charge higher rates. Could you plausibly accuse Tommy of having taken a 25-mile joyride, based on your answer to part (a)?

Hint: how far off can R_8 be from the exact distance he drove?