

Name: \_\_\_\_\_ PID: \_\_\_\_\_

MATH 10B: *Practice* FINAL EXAM, PART III  
(Part I = Midterm 1 and Part II = Midterm 2)

Do not turn the page until instructed to begin.

**Turn off and put away your cell phone.**

No calculators or any other devices are allowed.

You may use one 8.5×11 page of handwritten notes, but no other assistance.

Read each question carefully, answer each question completely, & show all of your work.

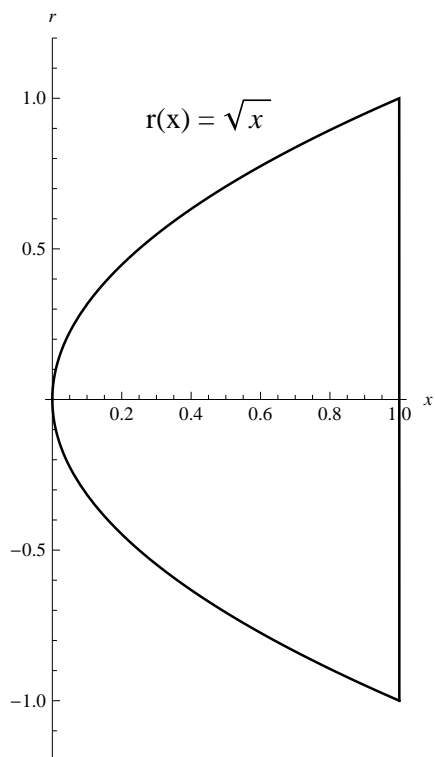
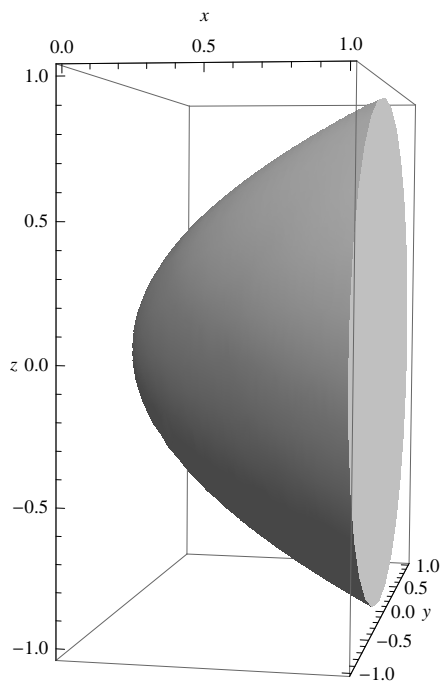
Write your solutions clearly and legibly; no credit will be given for illegible solutions.

If any question is not clear, ask for clarification.

Good luck!

#	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
$\Sigma$	90	

1. (10 points) Depicted below is a solid volume of revolution with radius given by the curve  $r(x) = \sqrt{x}$  for  $0 \leq x \leq 1$ . Find its volume.



2. Solve the following initial value problem.

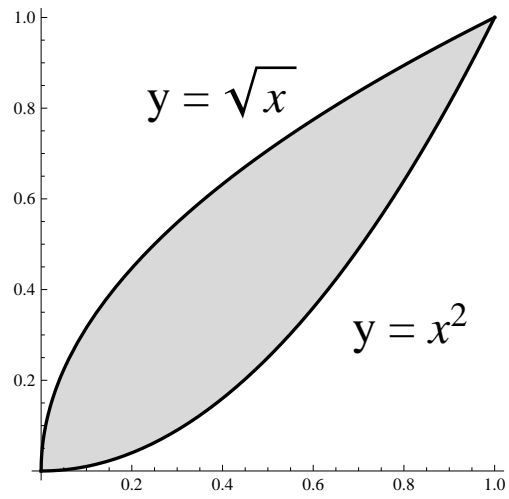
$$\frac{dy}{dx} = 2x^2 - 3 \sin(x) \quad y(0) = 0.$$

3. Take the following indefinite integrals. Integration by substitution ( $u$ -substitution) is the recommended method.

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

(b) (5 points)  $\int \frac{\sin(\ln(x))}{x} dx.$

4. (10 points) Find the shaded area (depicted below) between the curves  $y = \sqrt{x}$  and  $y = x^2$ , for  $0 \leq x \leq 1$ .



5. Take the following indefinite integrals. Integration by parts is the recommended method.

(a) (5 points)  $\int x \ln(2x) dx.$

(b) (5 points)  $\int \frac{x}{e^x} dx.$

6. Take the following indefinite integrals.

(a) (5 points)  $\int \frac{1}{9 + 4x^2} dx.$  (hint: trigonometric substitution)

(b) (5 points)  $\int \frac{x^2 + 1}{x^2(x + 1)} dx.$  (hint: partial fractions)

7. (10 points) After finishing your exams, you go out for ice cream in celebration. But when you finally get an ice cream cone and bring it up to your mouth, someone jostles your elbow and your scoop of ice cream falls off the cone. Assuming the ice cream is falling from 4 feet high, and given that the acceleration due to gravity is  $32 \text{ ft/s}^2$ , how long does it take to hit the ground?



8. (10 points) Your reaction to try and catch the scoop of ice cream wasn't fast enough, and it hit the ground. Given that your ice cream started at  $0^\circ\text{F}$ , and assuming that the temperature of the ice cream  $y(t)$  (where  $t$  is given in minutes since it hit the ground) is determined by the following differential equation,

$$\frac{dy}{dt} = \frac{64 - y}{16},$$

how many minutes does it take the ice cream to reach  $32^\circ\text{F}$  (when it starts to melt)?

9. For each of the following integrals, if it converges, write the number it converges to. Otherwise, you may simply write "diverges" as your answer.

(a) (5 points)  $\int_1^{\infty} \frac{1}{x^{4/3}} dx.$

(b) (5 points)  $\int_2^{\infty} \frac{1}{4x+1} dx.$