MA 1022 B '02 **Final Exam** **Name:** _____ .

Instructions

This test is closed book. Calculators are not allowed.

Part I - Basic Skills

Problem	1	2	3	4	5	6	7	Total
Value	5	5	5	5	5	5	5	35
Earned								

Part II

Problem	8	9	10	11	12	13	Total
Value	20	20	15	15	10	20	100
Earned							

Please Circle your Section

R. Scalzi (8:00)	R. Lui (9:00)	R. Lui (10:00)	V. Yakovlev (9:00)
V. Yakovlev (10:00)	D. Vermes (1:00)	D. Vermes (4:00)	J. Goulet (PLC)
D. Tang (1:00)	D. Tang (2:00)	A. Heinricher (PLC)	

Part I - Basic Skills

Work the following problems and write your answers in the space provided. Use the scratch paper provided for your work. You need not simplify your answers.

1. $\int_0^2 \left(x^2 + \pi^2\right)\, dx$

ans. _____

2. $\int_0^1 \frac{1}{(e^x)^2}\, dx$

ans. _____

3. $\int_1^e \frac{\ln(3x)}{x}\, dx$

ans. _____

4. $\frac{d}{dx}\int_0^{x^2} \arcsin(2\pi\theta)\, d\theta$

ans. _____

5. $\frac{d}{dx} \arctan\left(e^{2x}\right)$

ans. _____

6. $\int x(x-1)^{1/3} dx$

ans. _____

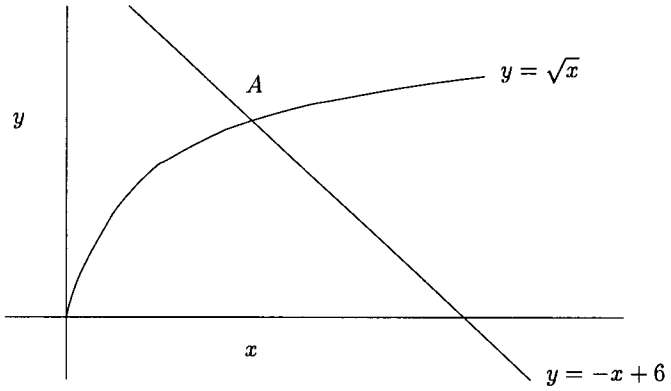
7. $\int xe^{-2x}\, dx$

ans. _____

Part II

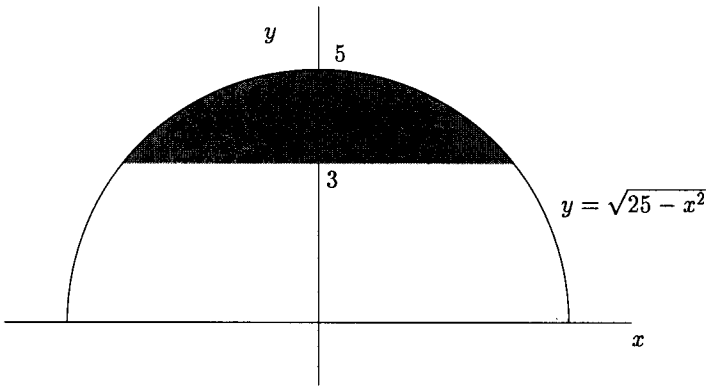
Work all of the following problems. Show your work in the space provided. You need not simplify your answers, but remember that on this part of the exam your work and your explanations are graded, not just the final answers.

8. Find the area of the region bounded by the curves $y = \sqrt{x}$, $y = -x + 6$, and the x axis, as shown in the figure below. Note that the coordinates of A, the intersection point of the two curves are $(4, 2)$.



9. A hole of radius 3 is to be drilled through the center of a solid sphere of radius 5. Determine the volume of the remaining part, i.e. of the sphere with a hole in it.

   Note: This volume is the same as the volume of the solid that is obtained by revolving the shaded area in the figure below about the x axis.



10. A cable weighing 1/3 lbs per foot is used to haul a 50 pound bucket of gold to the top of a mine shaft that is 400 feet deep. How much work is done in lifting the gold and the cable out of the mine?

11. Set up the three integrals needed to find the centroid of the region bounded by $y = x^4$, $y = x$, $x = 1$, and $x = 2$. Please, **do not evaluate** the integrals.

12. Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = x^{(e^x)}$

13. Evaluate each of the following integrals. In each case, explain your work clearly.

(a) $\int \frac{x}{1+x} dx$

(b) $\int \frac{x}{1+x^2} dx$

(c) $\int \frac{(\arctan(x))^2}{1+x^2} dx$