CALCULUS I/MATH 150
SHANNON GRACEY

- π 100 POINTS POSSIBLE
- π YOUR WORK MUST SUPPORT YOUR ANSWER FOR FULL CREDIT TO BE AWARDED
- π YOU MAY USE A TI-83/84/85/86 CALCULATOR
- π PROVIDE EXACT ANSWERS UNLESS OTHERWISE INDICATED

ONCE YOU BEGIN THE EXAM, YOU MAY NOT LEAVE THE PROCTORING CENTER UNTIL YOU ARE FINISHED…THIS MEANS NO BATHROOM BREAKS!

NAME______________________________

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(64 POINTS) Problems 1-8. Evaluate the definite integrals and find the indefinite integrals: Each question is worth 8 points. EXACT ANSWERS ONLY!!!

1. $\int_{2}^{6} |x-3|\,dx$

2. $\int \frac{2\theta^2}{\sin^2 \theta^3}\,d\theta$

3. $\int \frac{x}{\sqrt{1-x}}\,dx$

4. $\int \left(1+x^2\right)^3 dx$

5. $\int \cos^2 5x\,dx$

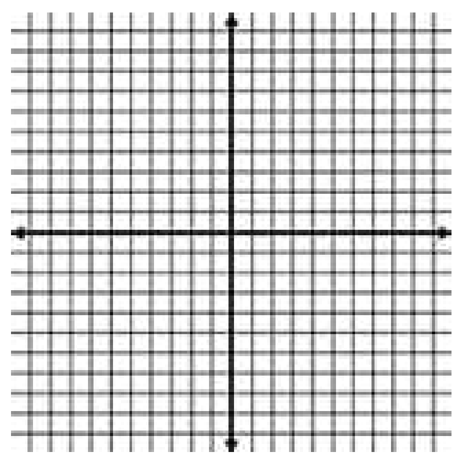
6. $\int\left(\frac{4x+x^{3/4}}{x^{1/4}}\right)dx$

7. $\int_{3}^{5}\frac{x^3+1}{x+1}dx$

8. $\int_{\pi/4}^{\pi/3}\tan^3 x\sec^2 x\,dx$

9. (5 POINTS) Find the average value of the function $f(x) = \frac{4}{x^2}$ on the interval $[1,4]$.

10. (5 POINTS) Sketch the region whose area is given by the definite integral. Then use a **geometric formula** to evaluate the integral. $\int_0^2 3x\,dx$.



11. (6 POINTS) Use **differentials** to approximate the value of the expression $\sqrt[3]{64.5}$.

12. (10 POINTS) Evaluate the definite integral by the **limit definition**.

$$\int_{1}^{3} \left(x^2\right) dx$$

13. (10 POINTS) From a thin piece of cardboard 10 in. by 10 in., square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? You must use calculus to solve; include your analysis, optimization, and verification—no credit awarded for trial and error! Round to the nearest tenth, if necessary.

Theorem: Summation Formulas

1. $\sum_{i=1}^{n} c = cn$

2. $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$

3. $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

4. $\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$