MAT 2410 Writing Project #3 (5 pts) Name_____
150 Points Prep for Final (Chapters 4 – 6)

You know the drill. And remember to circle final answers.

1. Ch 4 (5 pts) Use the limit definition of the definite integral to evaluate $\int_{-1}^{2}\left(x^2-3x\right)dx$. For simplicity, use the limit of the right-endpoint Riemann sum. On the final, I'll be looking for the correct Riemann Sum. Evaluating it will be bonus.

2. We find the area of the region bounded by $y=\sqrt{x}, y=x-2,$ and $x=0$ in two ways.

   a. Ch 3 (5 pts) Sketch the region.

   b. Ch 4 (5 pts) Write the area as an integral with respect to *x*. Draw a representative rectangle on the sketch from part a.

   c. Ch 4 (5 pts) Evaluate the integral from part b.

   d. Ch 3 (5 pts) Sketch the region again.

   e. Ch 4 (5 pts) Write the area as an integral with respect to *y*. Draw a representative rectangle on the sketch from part d.

   f. Ch 4 (5 pts) Evaluate the integral from part e.

   g. Ch 4 (5 pts bonus) Compare your results from parts c and f.

   h. Ch 5 (5 pts) Suppose we rotated the region about the line $x = -1$. Sketch the graph, and write the integral representing the volume of the solid of revolution obtained. Show a representative disc or washer.

3. We explore absolute value. Let $f\left(x\right)=2\sin\left(x\right)-1$

   a. Ch 3 (5 pts) Sketch a complete graph of $f\left(x\right)$ on the interval $\left[0,2\pi\right]$.

   b. Ch 4 (5 pts) Evaluate $\int_{0}^{2\pi} f\left(x\right)dx$.

   c. Ch 4 (5 pts) Sketch a complete graph of $g\left(x\right)=\left|2\cos\left(x\right)-1\right|=\left|f\left(x\right)\right|$ on the interval $\left[0,2\pi\right]$.

   d. Ch 4 (5 pts) Evaluate $\int_{0}^{2\pi} g\left(x\right)dx$.

4. Evaluate the indefinite integrals:

   a. Ch 4 (5 pts) $\int (2x-3)^4\,dx$

   b. Ch 4 (5 pts) $\int (2x-3)^4 x^2\,dx$

   c. Ch 4 (5 pts) $\int \sec^4(x)\tan(x)dx$

   d. Ch 6 & Ch 4 (5 pts) $\int \sin(x)\cdot e^{\cos(x)}\,dx$

5. Ch 4 Suppose I'm pacing back and forth, thinking my usual deep thoughts, and my rate of speed is given by $r(t)$, in feet per second. Tell me what the following integrals represent:

   a. (5 pts) $\int_0^{3600} |r(t)|\,dt$

   b. (5 pts) $\int_0^{3600} r(t)\,dt$

6. Perform the indicated differentiation:

   a. Ch 4 (5 pts) $\frac{d}{dx}\int_0^x \frac{\cos(3t)}{\sin(t)+4}dt$

   b. Ch 4 (5 pts) $\frac{d}{dx}\int_{x^2}^{\cos(x)} \frac{\cos(3t)}{\sin(t)+4}dt$

7. The function $f(x)=x^2-5x+11$ is 1-to-1 on the restricted domain $D=\left[\frac{5}{2},\infty\right)$.

   a. Ch 6 (5 pts) Find the inverse function $f^{-1}(x)$. State its domain and range.

   b. Ch 6 (5 pts) Find $\left(f^{-1}\right)'(5)$, directly, by differentiating your answer for part a.

   c. Ch 6 (5 pts) Find $\left(f^{-1}\right)'(5)$ by applying a theorem regarding derivatives of inverse functions.

8. (5 pts each) Find the derivative with respect to x.

   a. Ch 6 (5 pts) $y=7\cdot 3^{\cos(x)}$

b. Ch 6 (5 pts) $y = \ln\left(\dfrac{\sqrt[3]{x^2 - 5x}}{\sin^3(x)}\right)$

c. Ch 6 (5 pts) $y = \log_5\left(x^2 - 3x\right)$

d. Ch 6 (5 pts) $y = \left[\cos(x)\right]^{x^2 - 3x}$

9. Ch 6 (5 pts) The half-life of Millsium is 80 years. How old is a Mills skeleton from a burial mound if there is 12% of its natural radioactive Millsium remaining?