College of the Holy Cross, Spring 2018
Math 134 Makeup Midterm Exam 1
Monday, February 19

Your Name: ______________________________

Instructions: For full credit, you must show *all work* on the test pages and place your final answer in the box provided for the problem. Use the back of the preceding page if you need more space for scratch work. The numbers next to each part of the questions are their point values. The following power sum formulae may be useful:

Please do not write in the space below

Problem	Points/Poss
I	/ 30
II	/ 10
III	/ 20
IV	/ 40
Total	/100

I. Both parts of this problem refer to $f(x) = 3x^2 + 1$ on the interval $[a, b] = [1, 3]$.

A. (15) Evaluate the L_4 Riemann sum for f on this interval.

$L_4 = \boxed{}$

B. (10) Use Part I of the Fundamental Theorem of Calculus to evaluate $\int_1^3 3x^2 + 1\ dx$.

$\int_1^3 3x^2 + 1\ dx = \boxed{}$

C. (5) Your answer to part B should be larger than your answer to part A. Explain how you could know it would turn out that way even without computing the numerical values.

II. (10) The following limit of a sum would equal the definite integral $\int_a^b f(x)\,dx$ for some function $f(x)$ on some interval $[a, b]$. What function and what interval?

$$\lim_{N\to\infty} \sum_{j=1}^{N} \left(2 + \cos\left(\frac{2\pi j}{N}\right)\right) \cdot \frac{2\pi}{N}.$$

$f(x) = \boxed{}$

$[a, b] = \boxed{}$

III. Both parts of this problem refer to $f(x) = \dfrac{x}{x^4 + 2}$.

A. (10) Let $A(x) = \displaystyle\int_0^x f(t)\, dt$. What is $A'(x)$?

$A'(x) = \boxed{}$

B. (10) Now consider $B(x) = \displaystyle\int_1^{x^2} f(t)\, dt$. What is $B'(x)$?

$B'(x) = \boxed{}$

IV. Compute the following integrals.

A. (10) $\displaystyle\int 3\sqrt{x} + \frac{4}{x} + e^x \; dx$

Integral = $\boxed{}$

B. (10) $\displaystyle\int \sin(x) + \frac{1}{1+x^2} \; dx$

Integral = $\boxed{}$

C. (10) Integrate with a suitable u-substitution: $\displaystyle\int_0^1 (x^3+3)^{3/8} x^2 \, dx$.

Integral = $\boxed{}$

D. (10) Integrate with a suitable u-substitution: $\displaystyle\int (\sec(x))^2 \sec(x)\tan(x) \, dx$.

Integral = $\boxed{}$