College of the Holy Cross, Spring 2014
Math 136, section 1, Midterm Exam 1
Friday, February 21

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.

Please do not write in the space below

Problem	Points/Poss
I	/ 25
II	/ 10
III	/ 15
IV	/ 50
Total	/100

I. Let $f(x) = x^3 + 1$ on the interval $[a, b] = [1, 3]$.

A. (10) Evaluate the Riemann sum for f on this interval using $n = 4$ and $x_i^* =$ right endpoints.

Right-hand sum

B. (10) Now repeat part A, but using the left endpoints.

Left-hand sum

C. (5) One of your answers in parts A and B is definitely an overestimate for the value of $\int_1^3 x^3 + 1 \, dx$. Which is it?

Overestimate

II. Compute the derivatives of each of the following functions defined by integrals.

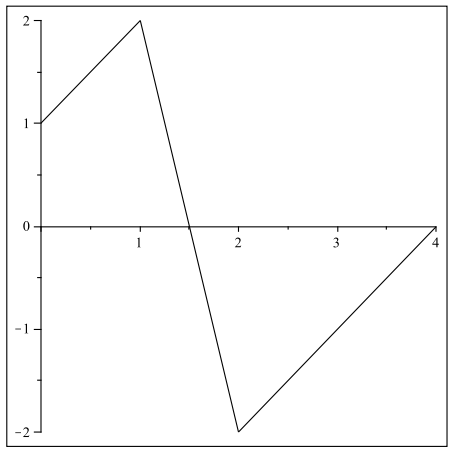
A. (5) $f(x) = \int_1^x e^{t^2}\, dt$

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

B. (5) $g(x) = \int_{x^2}^4 \frac{\cos(t)}{t^2}\, dt$

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

III. The following graph (made up of straight line segments) shows $y = f(t)$ for $0 \leq t \leq 4$.



Given: $f(1) = 2$, $f(2) = -2$, $f(3) = -1$, and $f(4) = 0$, The function F is defined by $F(x) = \int_0^x f(t)\, dt$.

A. (5) Determine the values $F(x)$ for $x = 0, 1, 2, 3, 4$ and enter them in the following table.

x	0	1	2	3	4
$F(x)$					

B. (5) Does $F(x)$ have any critical points? If so, say where. If not say why not.

Critical point(s) of $F(x)$

C. (5) Over which interval(s) is $F(x)$ concave down?

Concave down on:

IV.

A. (5) Integrate with a suitable u-substitution: $\displaystyle\int_0^1 (4x^3+1)^{3/5}x^2\ dx$.

Answer:

B. (10) Integrate with a suitable u-substitution: $\displaystyle\int \frac{x\sin(3x^2)}{\cos(3x^2)+1}\ dx$.

Answer:

C. (15) Integrate by parts: $\int x^2 \sin(5x)\, dx$

Answer:

D. (10) Integrate with any applicable method we have discussed: $\int_0^1 \frac{x}{\sqrt{x^2+1}}dx$

Answer:

E. (10) Integrate with any applicable method we have discussed: $\int e^x \cos(4x)\, dx$

Answer: