MATH 126 First Midterm

September 29, 2016

Name: _____ **ID:** _____ **Rec:** ____

Question:	1	2	3	4	5	Total
Points:	15	15	15	16	10	71
Score:						

There are 5 problems in this exam. Make sure that you have them all.

Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate what is where if you expect someone to look at it. **Books, calculators, extra papers, and discussions with friends are not permitted.** If you brought Donald Trump or Hillary Clinton with you to the exam, you may ask them to help you with any questions you may have, whether these questions are about calculus or other matters. However, you might want to fact-check any answers you get.

Points will be taken off for writing mathematically false statements, even if the rest of the problem is correct.

Use non-erasable pen (not red) if you want to be able to contest the grading of any problems. Questions with erasures will not be regraded.

Leave all answers in exact form (that is, do *not* approximate π, square roots, and so on.)

You have 90 minutes to complete this exam.

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1. Evaluate each of the definite integrals below. Justify your answer at least a little bit (that is "show work", even if you did the problem in your head.)

5points (a) $\int_{-1}^{2} 3x^2 - 6x + 1 \, dx$

5points (b) $\int_{0}^{2} \left|1 - x^2\right| \, dx$

5points (c) $\int_{0}^{3} \sin(\pi x/3) \, dx$

15points 2. Consider the function $f(x) = 1 + x^3$.

(a) Approximate the area lying under graph of $f(x)$, above the x-axis, and between the vertical lines $x = -1$ and $x = 5$ using 3 rectangles of equal width, evaluated at the **right endpoint** of each interval.

(b) Write a formula for the Riemann sum (using n rectangles of equal width) which represents the area under the graph of $f(x)$ for $-1 \leq x \leq 5$.

(c) Compute the limit of the above Riemann sum as $n \to \infty$. You can do this directly or by calculating an integral.

The formulæ $\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$, $\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$ or $\sum_{k=1}^{n} k^3 = \frac{n^2(n+1)^2}{4}$ could be helpful. Or not.

3. Evaluate each of the indefinite integrals below. Justify your answer at least a little bit (that is "show work", even if you did the problem in your head.) Don't forget the constant of integration!

5points (a) $\displaystyle\int \frac{7+x}{1+4x^2}\,dx$

5points (b) $\displaystyle\int te^{-2t}\,dt$

5points (c) $\displaystyle\int \tan\theta\,d\theta$

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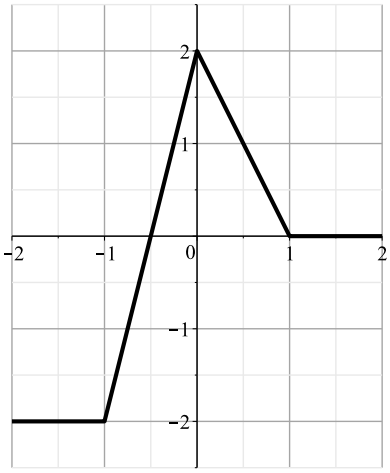
4. Let $f(x)$ be the function whose graph is shown at right, and let

$$G(x) = \int_{-1}^{x} f(t)\, dt$$



6points (a) Calculate $G(-2)$, $G(-1)$, and $G(2)$.
If G is not defined, write something like "$G(5)$ DNE".

5points (b) For what x with $-2 \leq x \leq 2$ is $G(x)$ decreasing? (If there are none, write "none".)

5points (c) For what x with $-2 \leq x \leq 2$ is $G(x)$ concave down? (If there are none, write "none".)

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10points 5. (a) Let $H(x) = \displaystyle\int_{x^2}^{1+x^3} \frac{1-t}{1+t}\, dt$. Calculate $H'(x)$.

(b) Find a function $g(x)$ so that $g'(x) = x\cos(x^2) + e^x$ and $g(0) = 2$.