MATH 126 First Midterm

October 11, 2016

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

Question:	1	2	3	4	5	Total
Points:	20	32	20	24	15	111
Score:						

There are 5 problems on 5 pages (plus this cover sheet) 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. No electronic devices may be used AT ALL.** You are welcome to read Prof. Sutherland's mind in order to obtain the solutions to this exam. Remember, however, that his algebra and arithmetic skills are terrible, and he's probably made at least one mistake on each problem. (If you have done this, please make an appropriate acknowledgment to avoid plagiarism issues.)

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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20 pts 1. A passenger plane touches down at Laguardia with a ground speed of 200 feet per second (about 136 mph). The pilot then reverses the engines to slow the plane down to 30 ft/sec, at which speed she can safely taxi to the gate. The table below gives the speed at t seconds after touchdown.

time (seconds)	0	2	4	6	8
speed (ft/sec)	200	160	100	40	30

Using the information above and assuming the plane's speed is decreasing continuously, use a Riemann sum to calculate both an upper bound and a lower bound on the distance the plane traveled (in feet) during the 8 seconds after touchdown.

For full credit, you must indicate clearly how you arrived at each answer.

$\square$ feet $\leq$ distance traveled $\leq$ $\square$ feet

2. Evaluate each of the integrals below. An answer given with no justification will receive little or no credit.

8 pts (a) $\displaystyle\int_0^1 \frac{5x+1}{1+x^2}\,dx$

8 pts (b) $\displaystyle\int x\sqrt{x-1}\,dx$

8 pts (c) $\displaystyle\int_0^{2\pi} |\sin x|\,dx$

8 pts (d) $\displaystyle\int xe^{2x}\,dx$

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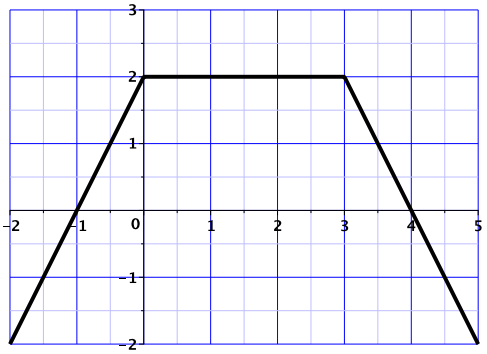
3. Let $g(t)$ be the function with graph shown at right, and let



$$F(x) = \int_{-2}^{x} g(t)\,dt$$

for $-2 \le x \le 5$.

For full credit, give at least a little justification for each of your answers to the questions below.

5 pts (a) On what interval(s) is $F(x) \le 0$?
If there are none, write "None".

5 pts (b) What is $F(3)$?
If $F(3)$ is not defined, write "DNE".

5 pts (c) What is $F'(0)$?
If $F'(0)$ does not exist, write "DNE".

5 pts (d) What is $F''(4)$?
If $F''(4)$ does not exist, write "DNE".

4. Let $h(x) = x^2 + 2x + 2$.

8 pts (a) Use a Riemann sum with three rectangles, evaluated on the right-hand side, to approximate $\int_{-4}^{2} h(x)\ dx$.

8 pts (b) Express $\int_{-4}^{2} x^2 + 2x + 2\ dx$ as a limit of a Riemann sum (with n rectangles). Your final answer should not include symbols like Δx or x_i.

8 pts (c) Calculate $\int_{-4}^{2} x^2 + 2x + 2\ dx$ exactly.

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15 pts 5. Calculate the indefinite integral $\int e^x \sin(4x)\, dx$.