MATH 1B
Summer 2019
Exam 2 - PRACTICE

Name (Print): ______________________

SID: ______________________

This exam contains 6 pages (including this cover page) and 5 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or any calculator on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- **If you use a "fundamental theorem" you must indicate this** and explain why the theorem may be applied.
- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- If you need more space, use the back of the pages; clearly indicate when you have done this.

Do not write in the table to the right.

Problem	Points	Score
1	14	
2	12	
3	10	
4	15	
5	10	
Total:	61	

1. Determine whether the following statements are true or false, if the statement is false give a counter example:

   (a) (2 points) If $a_n \geq 0$ for all n and the sequence $\{(-1)^n a_n\}$ converges, then $\lim_{n\to\infty} a_n = 0$.

   (b) (2 points) If $\lim_{n\to\infty} a_n = \infty$, then $\sum a_n$ diverges.

   (c) (2 points) If $\sum a_n$ and $\sum b_n$ converge, then $\sum(a_n + b_n)$ converges.

   (d) (2 points) The sequence $\{ar^n\}$ converges for $-1 \leq r \leq 1$.

   (e) (2 points) If $a_n \leq c_n \leq b_n$ and $\{a_n\}$ and $\{b_n\}$ converge as sequences then $\{c_n\}$ also converges as a sequence.

   (f) (2 points) If $\lim_{n\to\infty} a_n = \infty$ and $\lim_{n\to\infty} b_n = \infty$ then $\lim_{n\to\infty} a_n - b_n = 0$.

   (g) (2 points) If $f(x) > g(x) > 0$ for all x and $\int_1^\infty f(x)\, dx$ converges then $\int_1^\infty g(x)\, dx$ also converges.

2. Determine whether the following integrals converge or diverge using any method of your choosing.

   (a) (6 points) $\displaystyle\int_1^\infty \frac{1}{x^2+5x+6}\,dx$

   (b) (6 points) $\displaystyle\int_2^\infty \frac{\sin^2 x}{x^2}\,dx$

3. (10 points) Determine the length of the curve $y = 1 - e^x$, $0 \leq x \leq 2$.

4. Determine whether the following sequences converge or diverge. If the sequence converges, determine it's limit.

   (a) (5 points) $\left\{a_n = \dfrac{n^2 + \sqrt{n}}{\log n + 3n^2}\right\}_{n=1}^{\infty}$

   (b) (5 points) $\{a_n = \cos(5n)\}_{n=1}^{\infty}$

   (c) (5 points) $\left\{a_n = (-1)^n \dfrac{\sin n}{n}\right\}_{n=1}^{\infty}$

5. (10 points) Determine whether the following series converges or diverges,

$$\sum_{n=1}^{\infty} \frac{1}{n^3+1}$$