Math 1910, Prelim I   Name: _____

October 4th, 2016

PLACE AN X IN THE BOX TO INDICATE YOUR SECTION

☐	Aleksandra Niepla	201	MW 7:30–8:20pm	☐	Maru Sarazola	207	TR 9:05–9:55am
☐	Aleksandra Niepla	202	MW 8:35–9:25pm	☐	José Bastidas	208	TR 9:05–9:55am
☐	Maru Sarazola	203	TR 8:00–8:50am	☐	David Mehrle	209	TR 9:05–9:55am
☐	José Bastidas	204	TR 8:00–8:50am	☐	Nicholas LaVigne	210	TR 9:05–9:55am
☐	David Mehrle	205	TR 8:00–8:50am	☐	Abigail Turner	211	TR 12:20–1:10pm
☐	Nicholas LaVigne	206	TR 8:00–8:50am	☐	Abigail Turner	212	TR 1:25–2:15pm

INSTRUCTIONS

• PRINT your name and mark your section number **right now**.

• This test consists of eight pages (besides this cover sheet). Look over this test **as soon as the exam begins**. If you find any missing pages, please ask a proctor for another copy.

• **SHOW YOUR WORK.** To receive full credit, your answers must be neatly written, and logically organized. *Explain all steps that are not self–explanatory to an average student.* If you need more space, write on the back side of the preceding sheet, but be sure to label your work clearly.

• Scrap paper is available for rough work. You may not hand in work on scrap paper.

• You have 90 minutes to complete this exam.

• This is a closed book exam and no notes are allowed. You are **NOT** allowed to use a calculator, cell phone, or any other electronic devices.

• Academic integrity is expected of all Cornell University students at all times, whether in the presence or absence of members of the faculty. Understanding this, I declare I shall not give, use, or receive unauthorized aid in this examination.

Please sign below to indicate that you have read and agree to these instructions.

_____
    Signature of Student

OFFICIAL USE ONLY
(do not fill in)

1. _____ / 30 _____

2. _____ / 30 _____

3. _____ / 20 _____

4. _____ / 30 _____

5. _____ / 20 _____

6. _____ / 20 _____

Total: _____ / 150 _____

1. Compute the following indefinite integrals:

a.) $\displaystyle\int \frac{x\cos x + \sqrt{x} + 1}{x}\,dx$

b.) $\displaystyle\int \frac{t+2}{\sqrt{t^2 + 4t}}\,dt$

c.) $\displaystyle\int \frac{e^x}{1 + e^x}\,dx$

2. Compute the following definite integrals:

a.) $\displaystyle\int_0^\pi |\cos x|\, dx$

b.) $\displaystyle\int_0^1 \frac{d}{dx}\left(\frac{x+x^2}{x^4+1}\right) dx$

c.) $\displaystyle\int_{-\pi/4}^{\pi/4} \frac{\sin x}{\cos^2 x}\, dx$

3. Consider the "curved triangle" bounded above by the curves $y = x+2$ and $y = x^2$, and from below by the part of the x-axis that varies from $x = -2$ to 0. Draw the region and compute its area.

4. Let $\mathcal{R}$ be the region in the plane bounded by the curves:

$$y = \sqrt{x}, \quad y = 0, \quad x = 4.$$

Let $\mathcal{S}$ be the solid generated by rotating the region $\mathcal{R}$ around the x-axis.

a.) Sketch the region $\mathcal{R}$.

b.) Use the disk (or washer) method to find an integral that gives the volume of $\mathcal{S}$. Note: you do not need to compute the integral.

c.) Use the shell method to find an integral that gives the volume of $\mathcal{S}$. Note: you do not need to compute the integral.

d.) Using one of the integrals from the previous parts, find the volume of $\mathcal{S}$.

5. a.) Compute the derivative of the function

$$g(x) = \int_x^{x^2} e^{t^2} \, dt.$$

b.) Find the equation for the tangent line of the graph $y = g(x)$ at $x = 0$.

6. a.) Verify that the following indefinite integral is correct:

$$\int e^x \sin(x)\, dx = \frac{1}{2}e^x \sin(x) - \frac{1}{2}e^x \cos(x) + C.$$

b.) For each integer $N \geq 1$, define the number

$$R_N = \sum_{i=1}^{N} e^{i/N} \cdot \frac{1}{N}.$$

Compute the limit $\lim_{N\to\infty} R_N$ by recognizing R_N as a Riemann sum. Explain your answer.

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