Mini-Test #1 (v1) — Math 151 — Calculus II — Spring 2021

You have **ONE hour** (+ 10 mins) to submit your answers for this mini-test. Please strictly adhere to the following instructions:

(1) Write a **FULL** solution for **each** problem on a *separate* piece of paper. You need to use the methods that were taught in class and you need to show how you arrived to your answer. Failing to provide all the details on how you arrived to your answer will be deemed as suspicious and you risk being subject to disciplinary actions (in addition of getting an F in the whole test).

(2) Start each solution, on a *separate* piece of paper, by writing the question number. Write clearly/neatly and **BOX your final answers**. If you do not box your final answer, your answer will NOT be graded or you will get points deducted!

(3) When you are ready to submit, and **no later than 60 minutes after the start of the test**, collect all your answers into a **single PDF** and upload by matching the different pages of your PDF to the questions in the test. Each failure to match the correct problem will incur a point deduction.

(4) If the problem includes a figure: please reproduce the figure carefully so that you can use it to solve the question.

(5) Make sure to always upload pics/images that are not blurry and that are oriented correctly (an upside down or blurry pic earns NO points. Seriously!).

(6) Only use techniques that were taught in class and make sure that all of your answers are accompanied by their respective explanations. **No full work shown = no points.**

Here is an honor pledge that you need to sign and date. Failure to sign will automatically result in a zero for this test:

Question#1. HONOR PLEDGE:

(A) The material that I am uploading is **completely my own work**, and that I did not take, borrow, or copy any portions from ANY other sources. This includes, but it is not limited to, NOT using any of the following resources: calculator, internet [Chegg, Slader, WolframAlpha, IntegralCalculator, WhatsApp, Instagram, etc], cellpone, computer, roommate, friend, tutor, etc...

(B) I will NEVER post/share/send/upload/download (DURING or AFTER the test) ANY portions of this test to/from the internet or any other type of platform.

(C) I will **stop solving the test after 60mins** and will use the last 10mins for uploading. **It is MY responsibility to upload before the time runs out.** If I run out of time I will NOT contact the calc team for help.

I understand if I violate this honesty pledge, I will earn an F for the whole semester and I will be subject to disciplinary actions pursuant to the appropriate sections of the San Diego State University Policies.

WRITE BELOW:

"**I have read and understood all of the above points.**" and then sign you name, write your RedID, your section number and date:

I _____

_____ _____ _____ _____

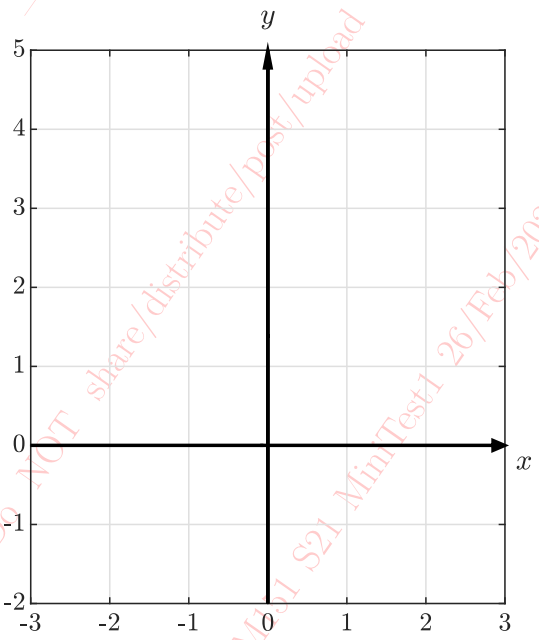
Signature RedID Sec.# date

2. (3 pts) [SDSU M151 S21 MiniTest1 V1 Q02 26/Feb/2021 5:00-6:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Find an integral (or integrals) for the area enclosed by the curves:

$$y = f(x) = x^2 + 2x \quad \text{and} \quad y = g(x) = -x^2 + 4.$$

You do **NOT** need to compute the integral(s).
Sketch the curves!!!



$A =$

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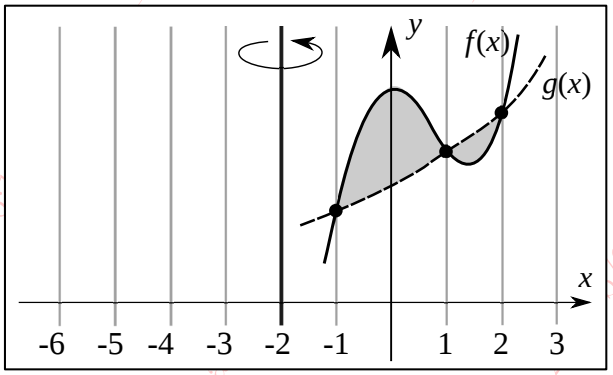
3. (4 pts) [SDSU M151 S21 MiniTest1 V1 Q03 26/Feb/2021 5:00-6:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Using the method of volumes by **SHELLS**, write an integral (or integrals) for the solid generated by rotating about the **$x = -2$ line** (note that the line is off-axis!) the shaded region on the figure. Do NOT forget to sketch a typical shell for this object.



$V =$

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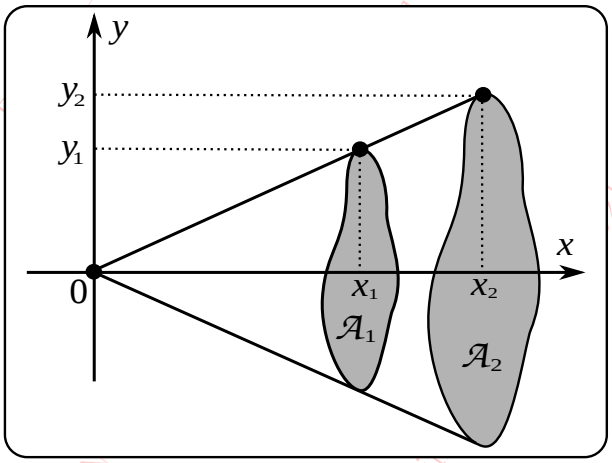
4. (4 pts) [SDSU M151 S21 MiniTest1 V1 Q04 26/Feb/2021 5:00-6:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Volumes by slices.



The law of similar triangles states that

$$\frac{x_2}{x_1} = \frac{y_2}{y_1},$$

with the distances as depicted in the figure. Similarly, it can be shown that the areas depicted in the figure are related through

$$\frac{\mathcal{A}_2}{\mathcal{A}_1} = \left(\frac{x_2}{x_1}\right)^2 = \left(\frac{y_2}{y_1}\right)^2.$$

Use this fact and the methods learned in class to compute the volume of a cone of height H and with an **arbitrary shape** base of area $\mathcal{A}$. Draw a diagram clearly indicating all objects/labels that you used.

5. (9 pts) [SDSU M151 S21 MiniTest1 V1 Q05 26/Feb/2021 5:00-6:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Using the methods learned in class, compute the following integrals. Show ALL details/steps (no details → no points).

a) (3 pts) $I_1 = \int \cos^3(x)\sin^q(x)\,dx$, where q an even constant.

$I_1 =$

b) (3 pts) $I_2 = \int x^a \ln(x)\,dx$, where a is a constant with $a > 1$.

$I_2 =$

c) (3 pts) $I_3 = \int \frac{2\delta}{x^2 - \delta^2}\,dx$, where δ is a constant Do **NOT** use inverse hyperbolic functions!

$I_3 =$

6. (4 pts) [SDSU M151 S21 MiniTest1 V1 Q06 26/Feb/2021 5:00-6:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

Using **trigonometric substitution** REWRITE the following x-integral as a θ-integral containing only trigonometric functions. Do NOT compute the integral!

$$I_4 = \int_0^3 \frac{x^3}{\sqrt{x^2+9}}\,dx.$$

$$I_4 = \int_{\square}^{\square} \qquad\qquad d\theta$$

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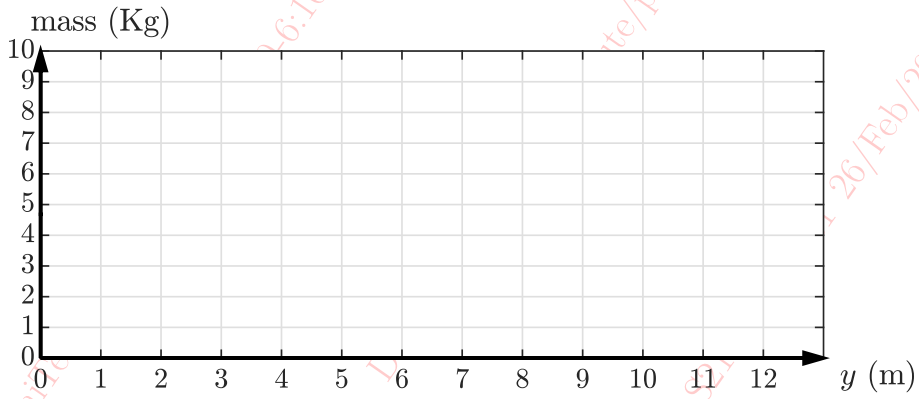
7. (3 pts) [SDSU M151 S21 MiniTest1 V1 Q07 26/Feb/2021 5:00-6:10pm PDT — Do NOT share/distribute/post/upload]
[Remember to **stop** solving and **submit** when there are **10 mins** (or more) left on the clock!!! No late submissions!]

[EXTRA CREDIT] Work: The leaky bucket:
A heavy bucket with an empty mass of **5 Kg** is filled with **4 Kg** of liquid. The bucket is pull up from the floor all the way up a building **12 m** tall. During the pull, the bucket leaks **1 Kg** of liquid per every **1 m** of vertical pull.

(a) In the axis below, plot the mass of the bucket *plus* the liquid as a function of y [y is the distance pulled in **m**]
[**Hint:** does the liquid empties before or after the bucket reaches the top?]



(b) How much work (in international SI units) is done to pull the bucket and the leaking liquid to the top of the building?
[**Hints:** $F = m \times g$ and use $g \approx 10$ m/s^2].

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