Math 142: Midterm 2

University of Rochester

November 8, 2022

Name: _____

UR ID: _____

UR E-mail: _____

Section	"X" your class time
MW 9 AM	
MW 3:25 PM	

- You are allowed one page, single-sided of notes. No other resources are permitted.

- The exam questions are on pages 2-11 of this packet.

- Each part of each question is on its own page. All work you want graded for that problem should be contained entirely on that page, unless:

- If you need more space on a problem, use the **Scratch work** pages at the end of the exam, and make sure to make a note on the problem page that you are doing so.

- **Do not tear off the scratch work pages.**

- Copy and sign the Honor Pledge: *I affirm that I will not give or receive any unauthorized help on this exam, and that all work will be my own.*
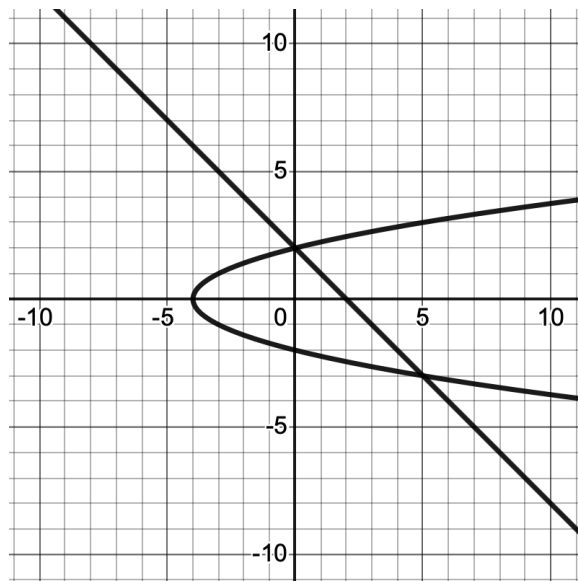
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Signature: _____

Question:	1	2	3	4	5	6	Total
Points:	20	20	10	30	10	10	100

1. Consider the region R in the xy-plane bounded by the curves $x = y^2 - 4$ and $y = 2 - x$, shown below.

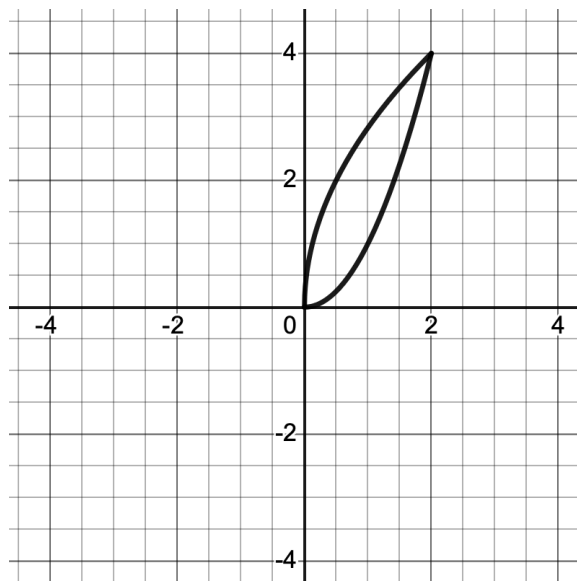(a) (10 points) Write down (but do not evaluate) an integral formula for the area of R with respect to x.

ANSWER:

(b) (10 points) Write down (but do not evaluate) an integral formula for the area of R with respect to y.

ANSWER:

2. Let R be the first quadrant region bounded by the curves $y = x^2$ and $y = 2\sqrt{2x}$, shown below:

(a) (10 points) Using the **washer method**, write down (but do not evaluate) an integral for the volume of the solid obtained by revolving R about the x-axis.

ANSWER:

(b) (10 points) Using the **washer method**, write down (but do not evaluate) an integral for the volume of the solid obtained by revolving R about the y-axis.

ANSWER:

3. (10 points) A region R bounded by the curves $y = x$ and $y = x^3 - 3x$ is shown below. Using the **shell method**, write down (but do not evaluate) an integral for the volume V of the solid S obtained by revolving R about the vertical line $x = 3$.
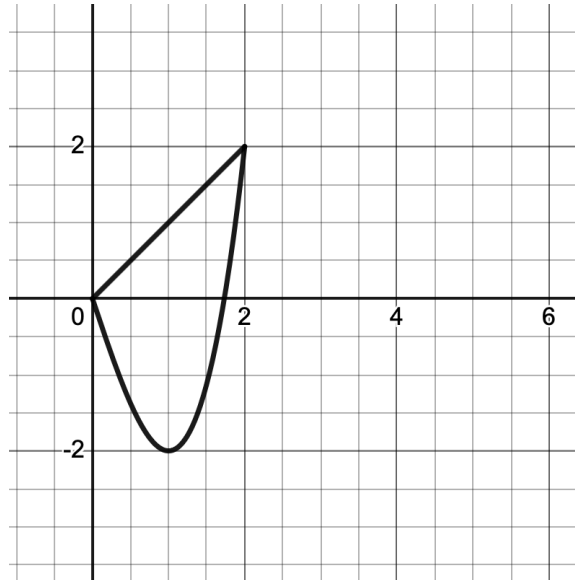
ANSWER:

4. Calculate the following integrals.

   (a) (10 points) $\int (1 + x^2)^{-1} e^{\arctan x} \, dx$

ANSWER:

(b) (10 points) $\displaystyle\int_1^6 2x\sqrt{x+3}\,dx$

ANSWER:

(c) (10 points) $\displaystyle\int \frac{(\ln(x))^2 + 1}{x}\, dx$

ANSWER:

5. (10 points) Let $g(x) = \int_1^{x^2+1} \cos\left(t - \dfrac{1}{t}\right) dt$. Find $g'(x)$.

ANSWER:

6. (10 points) Suppose that $\int_1^2 f(x)\,dx = 5$. Find $\int_0^{\pi/2} \dfrac{f(\sin(x)+1)\cos(x)}{2}\,dx$.

ANSWER:

Scratch work (first page) — DO NOT REMOVE

Scratch work (second page) — DO NOT REMOVE

Scratch work (third page) — DO NOT REMOVE