UNIVERSITY AT ALBANY
STATE UNIVERSITY OF NEW YORK

AMAT113 Calculus II Exam 1A October 4, 2024

Print Name:

UAlbany Email:

Instructors Name:

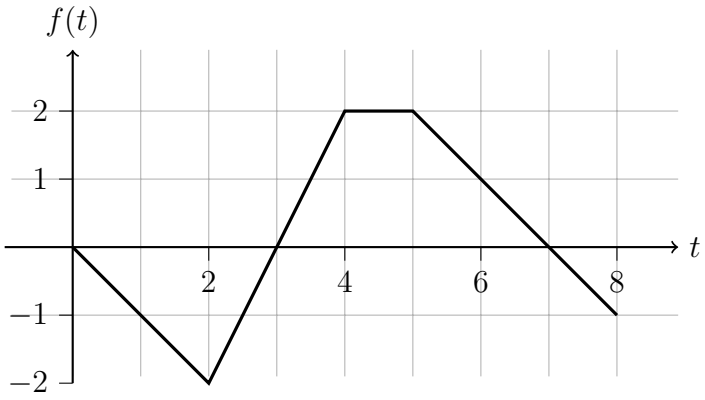
Directions: You have **75 minutes** to answer the following questions. ***You must show all necessary work*** as neatly and clearly as possible and clearly indicate your final answers.

No calculators, notes, textbooks, mobile phones or other aids are allowed. Do not detach pages.

Problem	Possible	Points
1	9	
2	5	
3	18	
4	12	
5	10	
6	11	
Total	65	

YOUR SIGNATURE:

(1) Let $g(x) = \int_1^x f(t)dt$ where f is the function whose graph is shown below.



Find:

(a) (2 points)

$g(1) =$

(b) (2 points)

$g(7) =$

(c) (2 points)

$g'(7) =$

(d) (3 points) At which x-value(s) does g have a local max? At which x-values does g have a local min?

YOUR SIGNATURE:

(2) (5 points) Evaluate

$$\frac{d}{dx}\int_{\sin x}^{2} \frac{e^t}{\sqrt{t^2+1}}dt$$

(3) (6 points each) Evaluate the following integrals:

(a) $\int_0^1 (\sqrt{x}+7)(1-x^2)dx$

(Problem 3 Continued)

(b) $\displaystyle\int \frac{e^x}{4e^{2x}+9}dx$

(c) $\displaystyle\int_0^{\pi/4} \frac{\sec^2(t)}{\tan(t)}dt$

YOUR SIGNATURE:

(4) (3 points each) Given that $\int_{-3}^{7} f(x)dx = 8.6$ and $\int_{-3}^{7} g(x)dx = -1.2$ and $\int_{-3}^{7} [f(x)]^2 dx = 15$, find each of the following:

(a) $\int_{-3}^{7} [f(x) - g(x)]dx =$

(b) $\int_{-1}^{\frac{7}{3}} g(3x)dx =$

(c) $\int_{-3}^{7} (f(x) - 2)^2 dx =$

(d) Find the average value of $f(x)$ on the interval [-3, 7].

YOUR SIGNATURE:

(5) (a) (4 points) Sketch the region bounded by the curves $y = \sqrt{x}$, $y = x - 20$, and the x-axis.

(b) (6 points) Find the area of this region.

YOUR SIGNATURE:

(6) (a) (3 points) Sketch the region bounded by the curves $y = 6x - x^2$ and $y = 2x$.

Set up, but do not evaluate, an integral to find the volume of the solid obtained by rotating the region about each given axis. (4 points each)

(b) ... rotated about the x-axis

(c) ... rotated about the line $x = -1$

YOUR SIGNATURE:

Useful formulas

1. $\int x^n \, dx = \frac{1}{n+1} x^{n+1} + C, \ (n \neq -1)$
2. $\int \frac{1}{x} \, dx = \ln|x| + C$
3. $\int a^x \, dx = \frac{1}{\ln a} a^x + C$
4. $\int \ln x \, dx = x \ln x - x + C$
5. $\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \frac{1}{a} \arcsin\left(\frac{x}{a}\right) + C$
6. $\int \sin ax \, dx = -\frac{1}{a} \cos ax + C$
7. $\int \cos ax \, dx = \frac{1}{a} \sin ax + C$
8. $\int \tan ax \, dx = -\frac{1}{a} \ln|\cos ax| + C$
9. $\int \frac{1}{x^2 + a^2} \, dx = \frac{1}{a} \arctan\left(\frac{x}{a}\right) + C$
10. $\int \frac{1}{x\sqrt{x^2 + a^2}} \, dx = \frac{1}{a} \operatorname{arcsec}\left(\frac{x}{a}\right) + C$