MATH 141: Exam 3
**Spring — 2025**
04/18/2025
50 Minutes

Name: _____

Write your name on the appropriate line on the exam cover sheet. This exam contains 7 pages (including this cover page) and 6 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	16	
2	14	
3	14	
4	20	
5	16	
6	20	
Total:	100	

1. (16 points) Consider the function $f(x) = x(6 - x)$ plotted below.
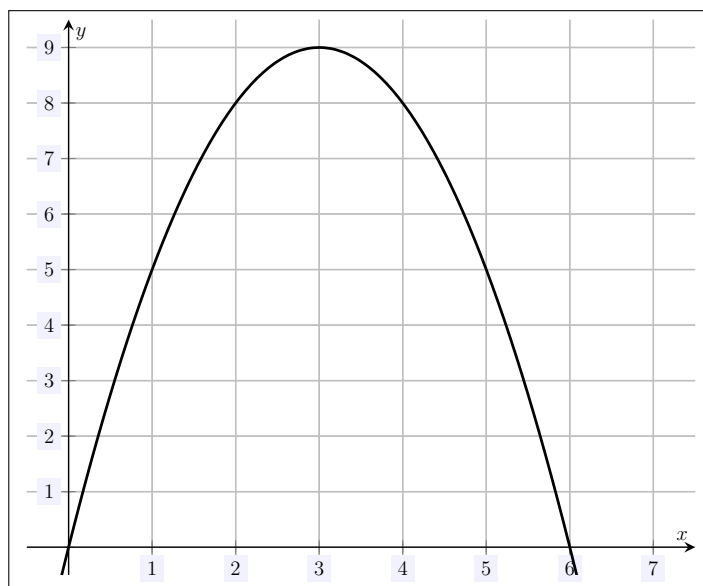
(a) Approximate the area under the curve $f(x)$ on $[0, 6]$ with a Riemann sum using a midpoint sum with $n = 3$ boxes—all with equal width.

(b) Sketch this approximation on the graph given above.

2. (14 points) Showing all your work and simplifying your result, compute the following:

$$\frac{d}{dx} \int_{e^x}^{8} \frac{\sin t}{t} \, dt$$

3. (14 points) Suppose $f(x)$ is a function such that $f(5) = 9$ and $\int_{0}^{5} f'(x) \, dx = 11$. Showing all your work, compute $f(0)$.
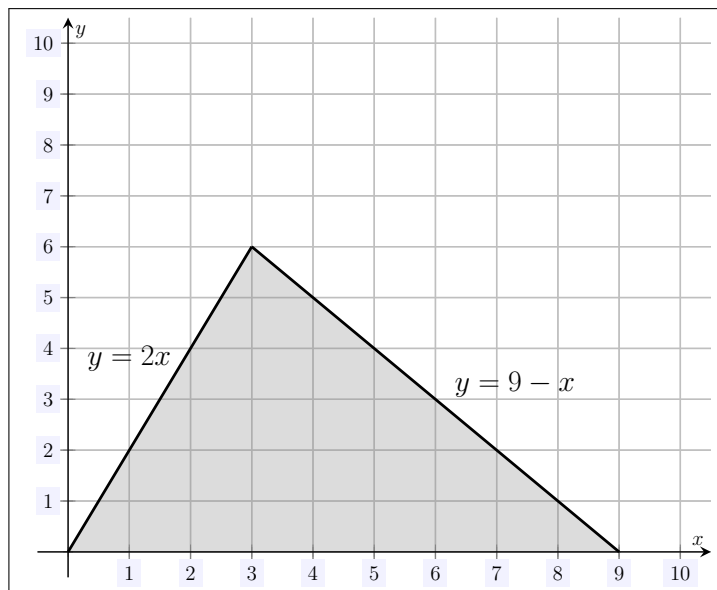
4. (20 points) Showing all your work, compute the following:

(a) $\displaystyle\int \frac{3x^5 + 2x^2 - x}{x^3}\, dx$

(b) $\displaystyle\int \left(2^x + \cos x - \tan x\right)\, dx$

(c) $\displaystyle\int_0^1 \left(x - x^{3/2}\right)\, dx$

5. (16 points) Consider the shaded area shown below.

(a) Set up **but do not evaluate** an integral expression **with respect to** x which computes the shaded area.

(b) Set up **but do not evaluate** an integral expression **with respect to** y which computes the shaded area.

6. (20 points) Showing all your work, compute the following:

(a) $\int \dfrac{x}{x+3}\, dx$

(b) $\int_0^2 6x^2 e^{x^3}\, dx$

Bonus. (10 points) Show that *both* $\dfrac{\cos(2x)}{-4}$ and $-\dfrac{1}{2}\cos^2 x$ are antiderivatives for $f(x) = \sin x \cos x$.