MATH 141: Exam 3 **Name:** _____
Fall —$_1$ 2025
11/21/2025
50 Minutes

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	15	
2	15	
3	15	
4	15	
5	15	
6	15	
Total:	90	

1. Showing all your work, compute the following:

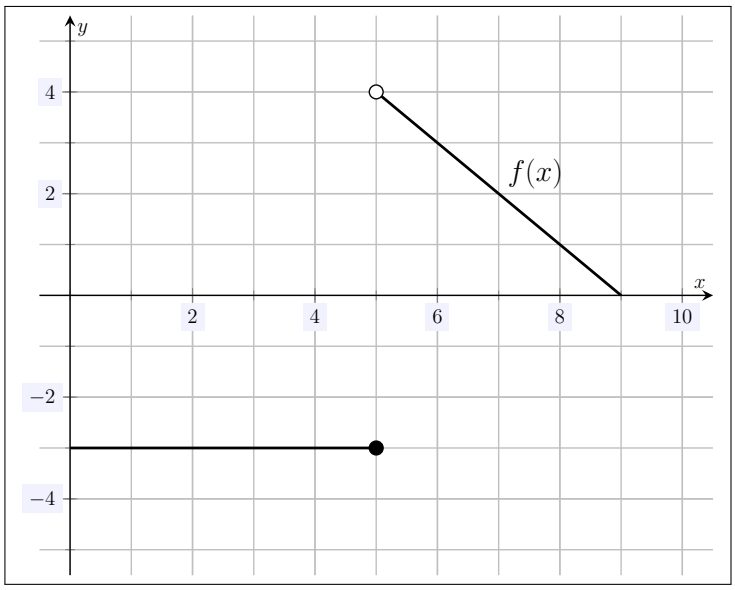
(a) (3 points) $\int \tan\theta \; d\theta$

(b) (3 points) $\int \sec\theta \; d\theta$

(c) (3 points) $\int \dfrac{dx}{x^2+1}$

(d) (6 points) $\dfrac{d}{dx}\displaystyle\int_{\cot x}^{\pi} \cos(t^2) \; dt$

2. (15 points) Below is a plot of a function $f(x)$. Showing all your work, use this plot to answer the questions below. *You may not find equations for* $f(x)$.



(a) $\int_4^4 f(x)\,dx$

(b) $\int_0^5 f(x)\,dx$

(c) $\int_5^0 f(x)\,dx$

(d) $\int_5^9 f(x)\,dx$

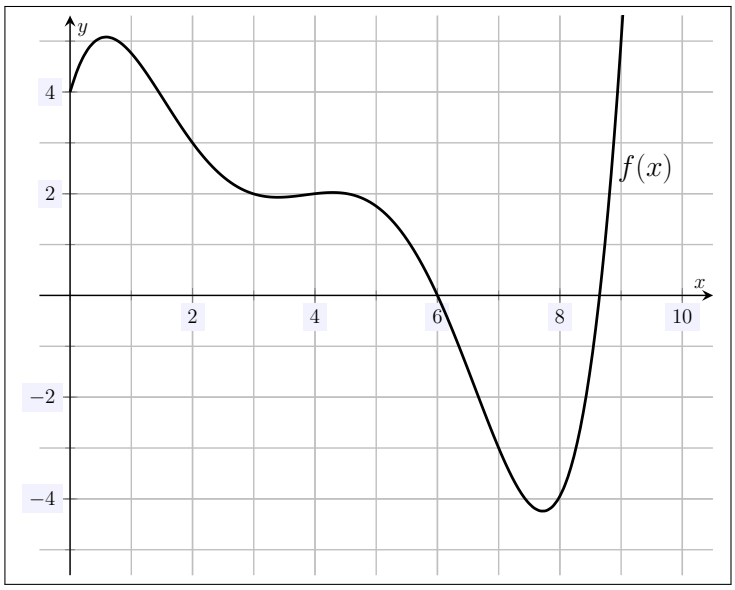
(e) Find the area between $f(x)$ and the x-axis.

3. (15 points) Choose **one** of the following problems and answer it. Clearly label the part chosen and circle it. Show all your work and fully justify your reasoning.

   (a) Show that the equation $2 - e^x = 4x$ has a solution in the interval $[0, 1]$.

   (b) Find the value(s), c, given by the Mean Value Theorem for the function $f(x) = x - x^2$ on $[-1, 5]$

4. (15 points) Below is a plot of a function $f(x)$. Estimate $\int_1^9 f(x)\,dx$ using a midpoint sum with four equally spaced rectangles.



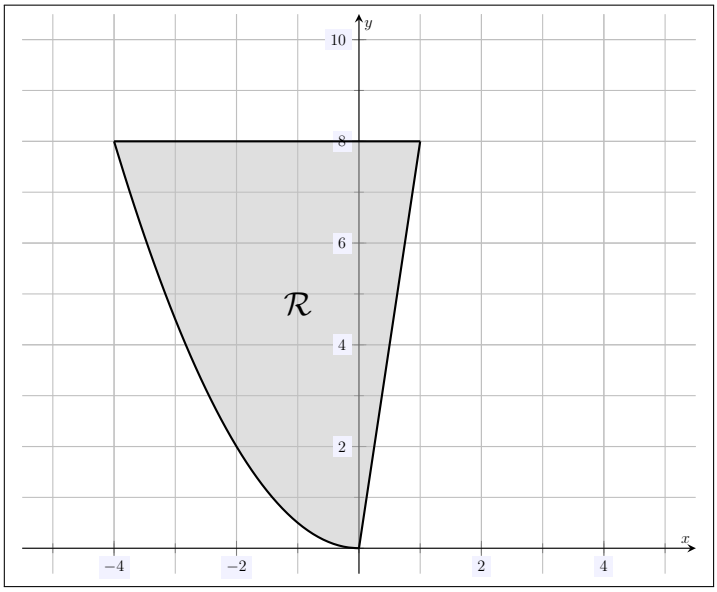
5. (15 points) Showing all your work, compute the following:

(a) $\displaystyle\int \left(\sin x - \frac{1}{x^{3/2}} + \frac{3}{x}\right)\, dx$

(b) $\displaystyle\int_{-1}^{1} (1 - x^3)\, dx$

(c) $\displaystyle\int \sec(x)\left(\sec x + \tan x\right)\, dx$

6. (15 points) A region $\mathcal{R}$ bound by the curves $y = \frac{1}{2}x^2$, $y = 8x$, and $y = 8$ is shaded in the figure below.



(a) Set up ***but do not evaluate or simplify*** an integral expression ***with respect to*** x that computes the area of $\mathcal{R}$.

(b) Set up ***but do not evaluate or simplify*** an integral expression ***with respect to*** y that computes the area of $\mathcal{R}$.