

Math 13200 – Section 58 – Midterm 3

May 27, 2016

Information and Directions

- This exam will last 50 minutes.
- This is a closed-book exam.
- No electronic devices are allowed to be used during this exam.
- **Partial credit is given for showing your calculations and explaining your thoughts.**

Name: _____

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	20	
6	20	
7	20	

Problem 1 (10 points)

Find the antiderivative $\int x^2 \cos(x^3 + 5) dx$.

Problem 2 (10 points)

Find the definite integral $\int_0^{\pi/6} \sin^2(3x) \cos(3x) dx$.

Problem 3 (10 points)

Find the definite integral $\int_4^9 \frac{(\sqrt{x} + 3)^2}{\sqrt{x}} dx$.

Problem 4 (10 points)

Find the definite integral $\int_{-18}^{18} \sin(x^{43}) dx$.

Hint: Because 43 is an odd number, for any number x it is true that

$$\sin((-x)^{43}) = \sin(-(x^{43})) = -\sin(x^{43})$$

Problem 5 (20 points)

Part 1 (10 points)

The Mean Value Theorem for Integrals says that if f is continuous on $[a, b]$, then there is at least one number c between a and b such that

$$f(c) = \boxed{}$$

(Complete the formula by writing the correct expression in the box.)

Hint: Remember, the MVT for Integrals is related to, but different than, the MVT for Derivatives.

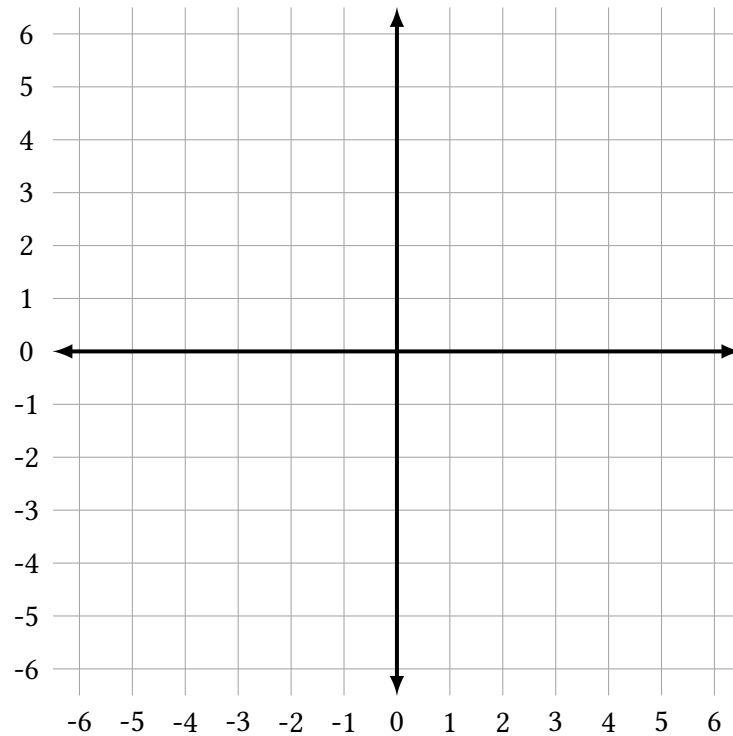
Part 2 (10 points)

For the function $f(x) = x^2 - 1$ and the interval $[-3, 6]$, find the number c that the Mean Value Theorem for Integrals guarantees must exist.

Problem 6 (20 points)

Consider the region bounded by the line $y = x$ and the curve $y = \frac{x^2}{4}$.

Here is a grid for your convenience if you would like to plot this region (optional – no points).



Part 1 (10 points)

Find the area of the region R .

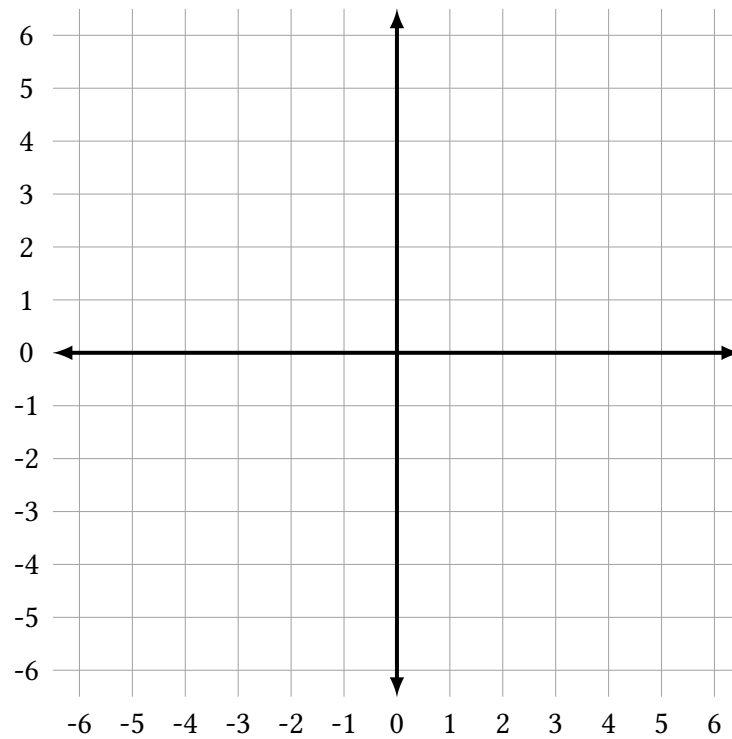
Part 2 (10 points)

If we rotate the region R around the x -axis, what is the volume of the resulting shape?

Problem 7 (20 points)

Consider the region R bounded by the lines $y = 0$, $x = 0$, and $x = 4$, and the curve $y = \sqrt{x^2 + 9}$.

Here is a grid for your convenience if you would like to plot this region (optional – no points).



Part 1 (10 points)

If a shape has the region R as its base, and every cross-section of the shape which is perpendicular to the x -axis is a square, what is the volume of the shape?

Part 2 (10 points)

If we rotate the region R around the y -axis, what is the volume of the resulting shape?