

Name: _____

Student ID: _____

Section: _____

Instructor: _____

Math 113 (Calculus II)

Midterm Exam 1

January 29–February 2, 2010

Instructions:

- Work on scratch paper will not be graded.
- For questions 6 to 11, show **all** your work in the space provided. Full credit will be given only if the necessary work is shown justifying your answer. Please write neatly.
- Should you have need for more space than is allotted to answer a question, use the back of the page the problem is on and indicate this fact.
- Simplify your answers. Expressions such as $\ln(1)$, e^0 , $\sin(\pi/2)$, etc. must be simplified for full credit.
- Calculators are not allowed.

For Instructor use only.

#	Possible	Earned
MC	15	
6a	15	
6d	10	
7	5	
8	10	
9a	5	
9b	5	
Sub	65	

#	Possible	Earned
9c	5	
9d	5	
9e	5	
9f	5	
10	5	
11a	5	
11b	5	
Sub	35	
Total	100	

Multiple Choice. Fill in the answer to each problem on your computer-scored answer sheet. Make sure your name, section and instructor are on that sheet.

1. Find the volume of the solid obtained by rotating the region bounded by the curves $y = \sec(x)$, $y = 0$, $x = 0$, $x = \frac{\pi}{4}$ about the x -axis.

- a) 1
- b) 2
- c) 3
- d) π
- e) $\frac{\pi}{2}$
- f) $\frac{\pi}{3}$
- g) None of the above

2. Find the average value of the function $f(x) = \sqrt[3]{x}$ on the interval $[1, 8]$.

- a) 12
- b) $\frac{12}{7}$
- c) $\frac{45}{4}$
- d) $\frac{3}{2}$
- e) $\frac{3}{14}$
- f) $\frac{45}{28}$
- g) None of the above

3. If $f(1) = 2$, $f(4) = 7$, $f'(1) = 5$, $f'(4) = 3$, and $f''(x)$ is continuous, what is $\int_1^4 x f''(x) dx$?

- a) 9
- b) -2
- c) 12
- d) -1
- e) 2
- f) None of the above.

4. What is $\int_0^{\frac{\pi}{4}} \sin^2(2\theta) d\theta$?

- a) 1
- b) 0
- c) $\frac{1}{2}$
- d) $\frac{\pi}{8}$
- e) $\frac{\pi - 2}{8}$
- f) None of the above

5. What is the best form for the partial fraction decomposition of $\frac{2x+1}{(x+1)^3(x^2+4)^2}$?

a) $\frac{A}{(x+1)^3} + \frac{Bx+C}{(x^2+4)^2}$

b) $\frac{A}{x+1} + \frac{B}{(x+1)^2} + \frac{C}{(x+1)^3} + \frac{Dx+E}{x^2+4} + \frac{Fx+G}{(x^2+4)^2}$

c) $\frac{A}{x+1} + \frac{B}{(x+1)^3} + \frac{Cx+D}{x^2+4}$

d) $\frac{A}{x+1} + \frac{B}{(x+1)^2} + \frac{C}{(x+1)^3} + \frac{D}{x^2+4} + \frac{E}{(x^2+4)^2}$

e) $\frac{A}{x+1} + \frac{B}{(x+1)^2} + \frac{C}{(x+1)^3} + \frac{Dx+E}{x^2+4} + \frac{Fx+G}{(x+1)^3(x^2+4)^2}$

f) None of the above

Free response: Write your solution and answer in the space provided. Answers not placed in this space will be ignored.

6. Consider the region between the curves $y = 5x$ and $y = x^2$ in the first quadrant.
- (a) (15 points) Set up an integral for the area of the region bounded by the curves. DO NOT EVALUATE.
- (b) Set up an integral for the volume obtained when the region is rotated about the x -axis. DO NOT EVALUATE.
- (c) Set up an integral for the volume obtained when the region is rotated about the y -axis. DO NOT EVALUATE.
- (d) (10 points) Set up an integral for the volume obtained when the region is rotated about the line $y = -2$. DO NOT EVALUATE.
- (e) Set up an integral for the volume obtained when the region is rotated about the line $x = -3$. DO NOT EVALUATE.

7. (5 points) A 12-ft chain weighs 36 lbs and hangs over the edge of a 20 ft high building. How much work is done in pulling the chain to the top of the building?

8. (10 points) The base of a solid is a circular disk with radius 3. Find the volume of the solid if parallel cross-sections perpendicular to the base are isosceles right triangles with one of the two equal sides lying along the base.

9. Integrate the following and show all of your work:

(a) (5 points) $\int \sin^6 x \cos^3 x \, dx$

(b) (5 points) $\int t^5 \ln t \, dt$

(c) (5 points) $\int \frac{\ln(\ln x)}{x \ln x} dx$

(d) (5 points) $\int x \sin 7x dx$

(e) (5 points) $\int x^3 \sqrt{x^2 + 1} dx$

(f) (5 points) $\int e^{2\theta} \cos 4\theta d\theta$

10. (5 points) A force of 12 lb is required to hold a spring stretched 3 in. beyond its natural length. How much work is done in stretching it from its natural length to 4 in. beyond its natural length?

11. Integrate the following:

(a) (5 points) $\int x\sqrt{1-x^4} dx$

(b) (5 points) $\int_2^3 \frac{2x + 3}{(x - 1)(x + 4)} dx$