

Name: _____

Student ID: _____

Section: _____

Instructor: _____

Math 113 (Calculus II)

Midterm Exam 3

March 26–March 30, 2010

Instructions:

- Work on scratch paper will not be graded.
- For questions 12 to 17, 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	36	
10	6	
11	5	
12a	5	
12b	5	
13a	5	
13b	5	
Sub	67	

#	Possible	Earned
13c	5	
14	6	
15a	5	
15b	5	
16	6	
17	6	
Sub	33	
Total	100	

6. Which of the following is true about the series $\sum_{n=1}^{\infty} \frac{n!}{1 \cdot 3 \cdot 5 \cdots (2n-1)}$

- a) The series diverges by the Ratio Test because the limit ratio is 2.
- b) The Ratio Test gives no information.
- c) The series converges by the Ratio Test because the limit ratio is $\frac{1}{2}$.
- d) The series converges by the Ratio Test because the limit ratio is $\frac{1}{3}$.
- e) The series converges by the Ratio Test because the limit ratio is 0.

7. Which of the following equations can be obtained by eliminating the parameters from

$$x = t^2 - 2, y = 5 - 2t?$$

- a) $x = 5 - 2\sqrt{y+2}$
- b) $x = \left(\frac{5-y}{2}\right)^2 - 2$
- c) $x = 23 - 20y + 4y^2$
- d) $x = 9 - y^2$
- e) $x = y^2 - 2y + 3$

8. What is the coefficient of x^4 in the MacLaurin series for $e^x \cos x^2$

- a) $\frac{13}{24}$
- b) $-\frac{13}{24}$
- c) $\frac{11}{24}$
- d) $-\frac{11}{24}$
- e) $\frac{15}{24}$
- f) None of the above.

9. At what (x, y) values does the curve $x = 10 - 4t^2, y = 8t^3 - 24t$ have a vertical tangent?

- a) $(6, -16), (6, 16)$
- b) $(0, 0)$
- c) $(\frac{\sqrt{10}}{2}, -11\sqrt{10})$
- d) $(\frac{\sqrt{10}}{2}, -11\sqrt{10}), (\frac{-\sqrt{10}}{2}, 11\sqrt{10})$
- e) $(10, 0)$
- f) $(10, 0), (6, 16), (6, -16)$
- g) None of the above.

Short Answer: Write your answer in the space provided. Answers not placed in this space will be ignored.

10. (6 points) Answer the following:

(a) The Maclaurin series for $\sin(2x)$ is: _____

(b) The curves

$$y = 2 + 3 \cos t, x = 3 \sin t, 0 \leq t \leq 2\pi$$

parametrize a circle of radius _____

centered at _____

.

11. (5 points) Evaluate the following limit: $\lim_{x \rightarrow 0} \frac{3 \tan^{-1} x^2 - 3x^2 + x^6}{x^{10}}$. _____

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

12. Determine whether the following series converge, and justify your answer.

(a) (5 points) $\sum_{n=1}^{\infty} \frac{1}{n + 3^n}$

(b) (5 points) $\sum_{n=1}^{\infty} n \sin\left(\frac{1}{n}\right)$

13. Find the interval of convergence for the following series:

(a) (5 points) $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2 2^n} (x+1)^n$

(b) (5 points) $\sum_{n=1}^{\infty} \frac{n!}{n^4} x^n$

(c) (5 points) $\sum_{n=1}^{\infty} \frac{(-2)^n(n-1)}{n^2+2}(x-3)^{2n}$

14. (6 points) Find the first four nonzero terms of a power series for

$$f(x) = (27 - x)^{1/3}.$$

15. (a) (5 points) Find a power series representation for

$$\int_0^1 \frac{x^2}{1+x^6} dx.$$

(b) (5 points) Suppose we approximate the integral in part (a) by summing the first k terms of the series. How large does k need to be so that the error of our approximation is no greater than 0.0006?

16. (6 points) Find an equation for the tangent line to the curve at the point corresponding to $t = 1$ on $x = t^4 + 1, y = t^3 + t$.

17. (6 points) Find the surface area generated by rotating the given curve about the y -axis:

$$x = e^t - t, y = 4e^{t/2}, 0 \leq t \leq 1$$