Name: _____

Instructor: _____

Math 10560, Practice Exam 3
April 18, 2012

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- No calculators.
- The exam lasts for 1 hour and 15 min.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 9 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)

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Multiple Choice	_____
9.	_____
10.	_____
11.	_____
12.	_____
Total	_____

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Multiple Choice

1.(7 pts.) Find $\sum_{n=1}^{\infty} \frac{2^{2n}}{3 \cdot 5^{n-1}}$.

(a) $\frac{4}{15}$ (b) $\frac{5}{4}$ (c) $\frac{5}{12}$ (d) $\frac{5}{3}$ (e) $\frac{20}{3}$

2.(7 pts.) The series

$$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{\sqrt{n}}$$

(a) diverges even though $\lim_{n\to\infty} \frac{(-1)^{n+1}}{\sqrt{n}} = 0$.

(b) does not converge absolutely but does converge conditionally.

(c) diverges because $\lim_{n\to\infty} \frac{(-1)^{n+1}}{\sqrt{n}} \neq 0$.

(d) converges absolutely.

(e) diverges because the terms alternate.

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3.(7 pts.) Use Comparison Tests to determine which **one** of the following series is divergent.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^{\frac{3}{2}}+1}$ (b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2+8}$ (c) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2-1}{n^3+100}$

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{n}{n+1}\left(\frac{1}{2}\right)^n$ (e) $\displaystyle\sum_{n=1}^{\infty} 7\left(\frac{5}{6}\right)^n$

4.(7 pts.) Consider the following series

(I) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{2n^2+7}{n^2+1}\right)^n$ (II) $\displaystyle\sum_{n=2}^{\infty} \frac{2^{1/n}}{n-1}$ (III) $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{e^n}$

Which of the following statements is true?

(a) (I) converges, (II) diverges, and (III) converges.

(b) (I) diverges, (II) diverges, and (III) converges.

(c) (I) converges, (II) diverges, and (III) diverges.

(d) They all diverge.

(e) They all converge.

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5.(7 pts.) Which series below is the MacLaurin series (Taylor series centered at 0) for $\dfrac{x^2}{1+x}$?

(a) $\displaystyle\sum_{n=0}^{\infty} \frac{x^{n+2}}{n+2}$

(b) $\displaystyle\sum_{n=0}^{\infty} (-1)^n \; x^{n+2}$

(c) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n x^{2n-2}}{n!}$

(d) $\displaystyle\sum_{n=0}^{\infty} x^{2n+2}$

(e) $\displaystyle\sum_{n=0}^{\infty} (-1)^n x^{2n}$

6.(7 pts.) Which series below is a power series for $\cos(\sqrt{x})$?

(a) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{(2n)!}$

(b) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{n^2+1}$

(c) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n-\frac{1}{2}}}{(2n)!}$

(d) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{(2n+1)!}$

(e) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n \sqrt{x}^{\,n}}{(2n)!}$

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7.(7 pts.) Calculate

$$\lim_{x \to 0} \frac{\sin(x^3) - x^3}{x^9}.$$

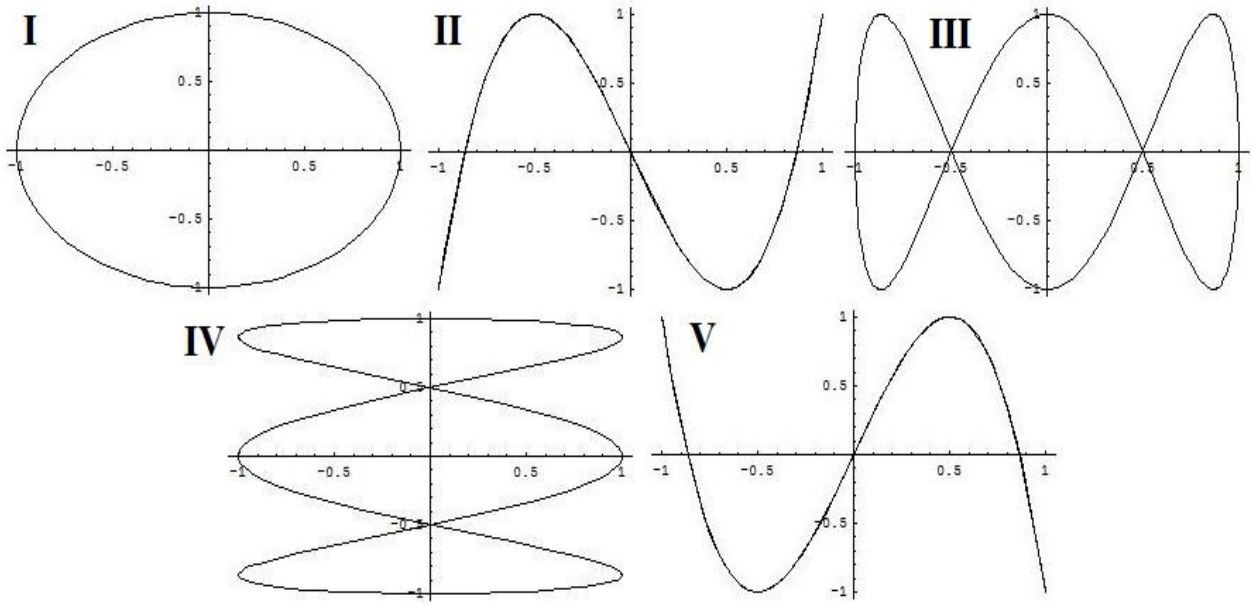
Hint: Without MacLaurin series this may be a long problem.

(a) 0 (b) $\frac{9}{7}$ (c) $\frac{7}{9}$ (d) ∞ (e) $-\frac{1}{6}$

8.(7 pts.) Which of the following is a graph of the parametric curve defined by

$$x = \sin(t) \qquad y = \cos(3t)$$

for $0 \leq t \leq 2\pi$?



(a) IV (b) II (c) III

(d) I (e) V

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Partial Credit

You must show your work on the partial credit problems to receive credit!

9.(11 pts.) Does the series

$$\sum_{n=1}^{\infty} \frac{(n!)^n}{n^{2n}}$$

converge or diverge? Show your reasoning and state clearly any theorems or tests you are using.

Remark: The correct answer with no justification is worth 2 points.

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10.(11 pts.) Use the Integral Test to discuss whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{(\ln n)^2}{n}$ converges.

Remark: Be sure to check that the Integral Test can be applied. The correct answer with no justification is worth 2 points.

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11.(11 pts.) Find the radius of convergence and interval of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}} (x-3)^n$$

Remark: The correct answer with no justification is worth 2 points.

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12.(11 pts.)

(a) Show that

$$\sum_{n=0}^{\infty}(-1)^n x^{2n} = \frac{1}{1+x^2}$$

provided that $|x| < 1$.

(b) Find

$$\sum_{n=0}^{\infty}\frac{(-1)^n}{(2n+1)(\sqrt{3})^{2n+1}}.$$

(**Hint:** First use term-by-term integration on the series in part (a).)

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