MAC 2312H (202) ∘ Honors Calculus II ∘ Spring 2014

FINAL EXAM

(SAMPLE)

NAME(print) _____

UCF PID _____

* **Show all your work** on the test itself. Correct answers with little or no supporting work will not be given credit.

* You are allowed a **hand written**, **8.5** in × **11** in, **one-sided** sheet of notes. Books, calculators or other aids are not allowed.

* Write legibly. **Circle** your final answer to each problem.

# 1	# 2	# 3	# 4	# 5	# 6	#7	TOTAL
14	9	9	9	9	24	26	100

1. Find the radius of convergence R and interval of convergence I of the series.

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

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

2. Find a power series representation for the function. Write the power series using summation notation. Determine the interval of convergence I.

$$f(x) = \frac{3}{3+x}$$

3. Find the Maclaurin series for $f(x) = \sin x$. Write the power series using summation notation.

4. Find the Taylor series for $f(x) = 1/x$ centered at $a = 2$. Write the power series using summation notation.

5. Given the parametric equations $x = 3t - 5$, $y = 2t + 1$, $0 \leqslant t \leqslant 2$,

(1) Eliminate the parameter to obtain an equation in x and y.

(2) Sketch the curve and indicate the positive orientation.

6. Determine whether the series converges or diverges. Specify what TEST is used.

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

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

(3) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n[1+(\ln n)^2]}$

(4) $\displaystyle\sum_{n=1}^{\infty} \frac{n+1}{n-1}$

7. Evaluate the integral.

(1) $\int \sin^5\theta \cos^4\theta \, d\theta$

(2) $\int xe^{-x} \, dx$

(3) $\displaystyle\int_0^4 \frac{x-1}{x^2-4x-5}\,dx$

(4) $\displaystyle\int \frac{1}{\sqrt{x^2-9}}\,dx$

ANSWERS:

1. (1) $R = \infty, \qquad I = (-\infty, \infty)$
   (2) $R = 1, \qquad I = [1, 3]$

2. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{-x}{3}\right)^n, \qquad I = (-3, 3)$

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

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

5. (1) $y = \dfrac{2}{3}x + \dfrac{13}{3}$
   (2) Line segment from $(-5, 1)$ to $(1, 5)$.

6. (1) Convergent (2) Convergent (3) Convergent (4) Divergent

7. (1) $-\dfrac{\cos^5\theta}{5} + \dfrac{2\cos^7\theta}{7} - \dfrac{\cos^9\theta}{9} + C$
   (3) $-xe^{-x} - e^{-x} + C$
   (3) $-\dfrac{1}{3}\ln 5$
   (4) $\ln \left| \dfrac{x}{3} + \dfrac{\sqrt{x^2-9}}{3} \right| + C$