

INSTRUCTIONS: Books, notes, and electronic devices are not permitted. Write (1) **your name**, (2) **1360/EXAM 3**, (3) **instructor's name** and (4) **SUMMER 2011** on the front of your bluebook. Also make a **scoring table** with room for 6 problems and a total score. **Work all problems. Start each problem on a new page. BOX your answers.** A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit.

– SHOW ALL WORK –

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1. a. Find the Maclaurin series for the function $\sinh(x) = \frac{e^x - e^{-x}}{2}$
b. What is the radius of convergence of the series in (a)?
c. Using the series found in (a), evaluate the integral $\int_0^1 \frac{\sinh(x)}{x} dx$
d. What is the bound on the error if we were to approximate the value of $\sinh(x)$ from $-1 \leq x \leq 1$ with the first five terms of the series in (a)?
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2. Let C be the curve defined by $x(t) = (2t + 3)^3$; $y(t) = t + \frac{t^2}{2}$.
a. Find the slope of C at $x = -8$
b. Set up but do not evaluate the integral to find the length of C from $0 \leq t \leq 5$
c. Set up but do not evaluate the integral to find the area under C from $0 \leq t \leq 5$
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3. a. Draw a graph of the circle $r = 1$ and the rose curve $r = \cos(2\theta)$
b. Find all the intersection points of the circle and the rose curve.
c. Find the area inside the circle but outside the rose curve
d. What is the slope of the tangent line to the rose curve at $\theta = \frac{\pi}{4}$
e. Set up but do not evaluate the integral to compute the arc length of one petal of the rose curve.
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4. a. Let A be the region enclosed by $x = e^y$, $x = e$, and the x -axis. Find the area of A .
b. Find the volume generated by revolving A about the x -axis.
c. Solve the initial value problem $\frac{dy}{dx} = xy^2$; $y(0) = 1$
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5. Determine whether the following series converge or diverge. If they converge, determine what they converge to. Be sure to indicate any tests you used and justify all your work.
- a. $\sum_{n=3}^{\infty} \left(\frac{2}{(n-1)(n-2)} \right)$
b. $\sum_{n=1}^{\infty} \frac{(-1)^n 2^{n-1}}{3^{n+1}}$
c. $\sum_{n=1}^{\infty} \left(\frac{3}{n} \right)^{\frac{1}{n}}$
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