Math 1232 Practice Final

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(a) These are the instructions you will see on the real test, next week. I include them here so you know what to expect.

(b) You will have 120 minutes for this test.

(c) You are not allowed to consult books or notes during the test, but you may use a one-page, two-sided, handwritten cheat sheet you have made for yourself ahead of time.

(d) You may use a calculator, but don't use a graphing calculator or anything else that can do symbolic computations. Using a calculator for basic arithmetic is fine.

(e) This test has 14 questions, over 9 pages. **You should not answer all the questions.**

  (a) The first four problems are one page each, representing the four major topics. You should do all four of them, and they are worth 30?? points each.

  (b) The remaining 10 problems represent topics S1 through S10. You will be graded on your best four, with a few possible bonus points if you also do well on further questions.

  (c) But doing four secondary topics well is much better than doing six poorly.

  (d) If you perform well on a question on this test it will update your mastery scores. Achieving a 27/30 on a major topic or 9/10 on a secondary topic will count as getting a 2 on a mastery quiz.

Name:

Recitation Section:

Major Topic 1. (a) Compute $\displaystyle\int \frac{x}{\sqrt{4-x^4}}\,dx$.

(b) Compute $\displaystyle\int 5^{3x}\,dx$.

(c) Write a tangent line to the curve $y^2 = x^{x\cos(x)}$ at the point $(\pi/2, -1)$.

Major Topic 2. (a) $\displaystyle\int \sin x \cos 2x \, dx$

(b) $\displaystyle\int_{\sqrt{7}}^{2\sqrt{7}} \frac{dx}{x\sqrt{x^2-7}}$

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

Major Topic 3. (a) Analyze the convergence of $\displaystyle\sum_{n=2}^{\infty} \frac{3(-1)^n}{n\ln(n)}$.

(b) Analyze the convergence of $\displaystyle\sum_{n=1}^{\infty}(-1)^n\left(\frac{5n+7}{8n-4}\right)^n$.

(c) Analyze the convergence of $\displaystyle\sum_{n=1}^{\infty}(-1)^n\frac{n^3+n^2+n+1}{\sqrt{n^9}}$.

Major Topic 4. (a) Find a power series for $\frac{1}{x^3}(e^{2x^3} - 1)$, and write down the first three non-zero terms explicitly.

(b) Find a power series for $x^2 \arctan(x^2)$ centered at 0.

(c) Find the degree-three Taylor polynomial for $f(x) = \frac{3}{x^3}$ centered at 3.

Secondary Topic 1. Let $g(x) = \sqrt[5]{x^9 + x^7 + x + 1}$. Find $(g^{-1})'(1)$.

Secondary Topic 2. Compute $\lim_{x \to 0} \dfrac{e^x - \tan(x) - 1}{x^2}$

Secondary Topic 3. Approximate $\int_1^5 3^x \, dx$ with four intervals and Simpson's Rule.

Secondary Topic 4. $\int_1^{+\infty} \frac{1}{x^2 - 2x} \, dx$

Secondary Topic 5. Find the area of the surface obtained by rotating the curve $x = 1 + 2y^2$ for $1 \leq y \leq 2$ about the x-axis.

Secondary Topic 6. Find the (specific) solution to $y' = x^2y^3$ if $y(0) = 1$.

Secondary Topic 7. Compute $\lim_{n\to\infty} \dfrac{2^n n!}{(2n)!}$.

Secondary Topic 8. Find the radius and interval of convergence of $\displaystyle\sum_{n=0}^{\infty} \frac{(x-3)^n}{(2n)^2+1}$.

Secondary Topic 9. Use a second-degree Taylor polynomial to approximate $\sqrt[4]{82}$.

Secondary Topic 10. Find an equation for the tangent line to the curve defined by the polar equation $r = 2 + \sin(3\theta)$ at the point $\theta = \pi/4$.