Calculus II - Final Exam
December 12, 2001
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Name: ______________________
Recitation Hour: ______________________
Recitation Instructor: ______________

Problem	Score	Problem	Score
1a		9e	
1b		9d	
1c		9e	
1d		9f	
2a		9g	
2b		9h	
2c		10a	
2d		10b	
3a		11a	
3b		11b	
4		12	
5		13	
6		14a	
7		14b	
8		14c	
9a		14d	
9b		15	
9c		Total	

1. Compute the following:

a) $\log_{10} 10,000$

b) $e^{\ln 7}$

c) $10^{2\log_{10} 5}$

d) $\ln(e^5)$

2. Differentiate

a) e^{x^2}

b) $\ln(2x + 3)$

c) 10^{x^2+3x}

$\log_{10}(x)$

3. Integrate

$\displaystyle\int \frac{1}{2x-3}\, dx$

b) $\displaystyle\int 10^x\, dx$

4. Find $\dfrac{dy}{dx}$ by implicit differentiation if x and y satisfy the relation $e^x + e^y = e^{xy}$.

5. Use the logarithmic differentiation to calculate $\dfrac{dy}{dx}$ if $y = \dfrac{\sqrt{(x^2+3)^3}}{\sqrt[3]{x^3+x}}$.

6. In a certain culture of bacteria, the number of bacteria increase eightfold in 12 hours. How long does it take their number to double?

7. State the definition of the function $y = \arctan x$.

8. Differentiate

a) $y = \arcsin x$

b) $y = \arctan\left(x^2\right)$

9. Integrate

a) $\displaystyle\int \frac{dx}{9+x^2}$

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

c) $\displaystyle\int \frac{\sinh(x)}{1+\cosh(x)}\,dx$

d) $\displaystyle\int \sin^3 x \cos x\,dx$

e) $\displaystyle\int \tan 2x\,dx$

f) $\displaystyle\int x^2 \ln(x)\, dx$

g) $\displaystyle\int \sin^3 5x\, dx$

h) $\displaystyle\int \frac{1}{x^2 - 2x}\, dx$

10. Find the limits

a) $\displaystyle\lim_{x\to 0^+} \frac{1 - \cos\sqrt{x}}{x}$

b) $\displaystyle\lim_{x\to 1} \frac{x^3 - 1}{x^2 - 1}$

11. Determine if the following improper integrals converge. If they do, evaluate them.

a) $\displaystyle\int_2^\infty \frac{1}{2x - 3}\, dx$

b) $\displaystyle\int_3^\infty \frac{1}{x^{\frac{3}{2}}}\, dx$

12. Find the radius and center of the circle $5x^2 + 5y^2 - 10x - 20y = 15$.

13. Find the slope of the tangent line of the cycloid $x = a(t - \sin t)$, $y = a(1 - \cos t)$ when $t = 2$.

14. Which of the following series converge? Give a reason.

a) $\sum \frac{1}{2n-3}$

b) $\sum \frac{\sin x}{3x^2}$

c) $\sum \frac{2^n}{3^n + 5}$

d) $\sum \frac{1}{(\ln n)^2}$

15. Find the radius of convergence of $\sum \frac{x^n}{n2^n}$.