

Name: _____

Instructor: _____

Math 10360, Exam 1
September 25, 2007

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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 11 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!					
1.	(a)	(b)	(c)	(d)	(e)
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Multiple Choice _____

13. _____

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Multiple Choice

1.(5 pts.) If $x > 3$, which of the following is equal to

$$\ln \frac{\sqrt[4]{x^2 - 9}}{(x^2 + 4)^2} \quad ?$$

(a) $4 \ln(x - 3) + 4 \ln(x + 3) - 2 \ln(x^2 + 4)$

(b) $\ln\left(\frac{1}{4}(x^2 - 9) - 2(x^2 + 4)\right)$

(c) $\frac{2 \ln(x - 3) \ln(x + 3)}{\ln(x^2 + 4)}$

(d) $\frac{1}{4} \ln(x - 3) + \frac{1}{4} \ln(x + 3) - 2 \ln(x^2 + 4)$

(e) $\frac{(\ln(x - 3) + \ln(x + 3))^{1/4}}{(\ln(x^2 + 4))^2}$

2.(5 pts.) Which of the following is the equation of the tangent line to the curve

$$\ln(y) \ln(x) = 1$$

at the point $(e^{1/2}, e^2)$?

(a) $y + e^{3/2}x = 2e^2$

(b) $y + 3e^{3/2}x = 4e^2$

(c) $y + 4e^{3/2}x = 5e^2$

(d) $y + 2e^{3/2}x = 3e^2$

(e) $y + 5e^{3/2}x = 6e^2$

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3.(5 pts.) If $f(x)$ is a differentiable function with inverse function $f^{-1}(x)$ satisfying

$$f(1) = 2, \quad f(2) = 3, \quad f'(1) = 4, \quad f'(2) = 3, \quad f'(3) = 2$$

which of the following is equal to $(f')^{-1}(2)$?

- (a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) 3 (d) 4 (e) $\frac{1}{4}$

4.(5 pts.) Which of the following functions is equal to the derivative $f'(x)$ of the function

$$f(x) = e^{\sin x} ?$$

- (a) $\cos x e^{\cos x}$ (b) $\cos x e^{\sin x}$ (c) $\cos x e^{-\sin x}$
(d) $-\sin x e^{\cos x}$ (e) $\sin x e^{\cos x}$

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5.(5 pts.) Evaluate the integral

$$\int \frac{3 + 2e^x}{e^{3x}} dx.$$

- (a) $3e^{-2x} + 2e^{-2x} + C$ (b) $\frac{3 + 2e^x}{e^{3x}} + C$ (c) $-3e^{-2x} - 2e^{-2x} + C$
(d) $-e^{-3x} - e^{-2x} + C$ (e) $e^{-3x} + e^{-2x} + C$

6.(5 pts.) Evaluate the integral

$$\int \frac{\sin x}{2 + \cos x} dx.$$

- (a) $\ln(2 + \sin x) + C$ (b) $-\ln(2 + \cos x) + C$ (c) $\ln(2 - \sin x) + C$
(d) $\ln(2 + \cos x) + C$ (e) $-\ln(2 + \sin x) + C$

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7.(5 pts.) If

$$\log_3(x - 5) = 3$$

then

(a) $x = e^3 + 5$

(b) $x = 18$

(c) $x = 32$

(d) $x = \ln 3 + 5$

(e) $x = 14$

8.(5 pts.) Which of the following is the value of

$$\sin \left(\arctan \left(\frac{x}{\sqrt{3}} \right) \right) ?$$

(a) $\frac{x}{\sqrt{x^2 + 3}}$

(b) $\frac{\sqrt{3}}{\sqrt{x^2 - 3}}$

(c) $\frac{x}{\sqrt{x^2 - 3}}$

(d) $\frac{\sqrt{x^2 + 3}}{\sqrt{3}}$

(e) $\frac{\sqrt{x^2 - 3}}{x}$

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9.(5 pts.) The equation of the tangent line to the graph of the function

$$f(x) = \arcsin(3x)$$

at the point where $x = \frac{1}{6}$ is given by

(a) $y = \frac{\pi}{6} + \frac{2}{\sqrt{3}} \left(x - \frac{1}{6} \right)$

(b) $y = \frac{\pi}{3} + \frac{2}{\sqrt{3}} \left(x - \frac{1}{6} \right)$

(c) $y = \frac{\pi}{6} + 2\sqrt{3} \left(x - \frac{1}{6} \right)$

(d) $y = \frac{\pi}{6} + \sqrt{3} \left(x - \frac{1}{6} \right)$

(e) $y = \frac{\pi}{3} + 2\sqrt{3} \left(x - \frac{1}{6} \right)$

10.(5 pts.) Evaluate

$$\int_0^{\frac{\pi}{2}} \frac{\sin x}{1 + \cos^2 x} dx.$$

(a) 0 (b) 1 (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$ (e) $\frac{1}{2} \ln 2$

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11.(5 pts.) \$2000 is invested in a savings account in which the interest is compounded continuously. What is the annual interest rate (**as a percentage**) if it takes 20 years for the balance to be \$4000?

- (a) $r = 20 \ln 5 \%$ (b) $r = 2 \ln 5 \%$ (c) $r = 2 \ln 20 \%$
(d) $r = 20 \ln 2 \%$ (e) $r = 5 \ln 2 \%$

12.(5 pts.) Which of the following is a solution of the differential equation

$$y' + y = x ?$$

- (a) $y = x - 1 + 2e^{-x}$ (b) $y = 1 + e^{-x}$
(c) $y = e^{-x}$ (d) $y = x - 1 + 2e^x$
(e) $y = x - 3e^{-x}$

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Partial Credit

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

13.(10 pts.) Use the substitution $u = \sqrt{x} + 1$ to evaluate the integral

$$\int \frac{x}{\sqrt{x}(\sqrt{x} + 1)} dx.$$

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14.(10 pts.) If

$$F(x) = \int_0^{e^{2x}} \ln(t^2 + 1) dt,$$

evaluate the derivative $F'(x)$.

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15.(10 pts.) Use logarithmic differentiation to find dy/dx where

$$y = x^{\ln x}.$$

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16.(10 pts.) Evaluate

$$\int_0^{\sqrt{2}} \frac{x}{x^4 + 4} dx.$$

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