

Multiple Choice

1.(5pts) Let $f(x) = e^x + \ln x$ for $x > 0$. Find $\frac{df^{-1}}{dx}(e)$.

- (a) $\frac{1}{e}$ (b) e (c) $\frac{1}{e+1}$ (d) f is not one to one (e) $(e^e + \frac{1}{e})^{-1}$.

2.(5pts) Compute $\int_1^{e^\pi} \frac{\sin(\ln x)}{x} dx$

- (a) 1 (b) 2 (c) -2 (d) 0 (e) π

3.(5pts) Find the critical point(s) of $f(x) = xe^x$ and determine whether they are local minima, maxima or neither.

- (a) $x = 0$, local max (b) no critical points (c) $x = e$ neither
(d) $x = 1$, local max (e) $x = -1$, local min

4.(5pts) Find all solutions of the equation $\log_4(1 + 2x) = \log_2(3)$

- (a) no solutions (b) 4 (c) 2 (d) 1 (e) -2

5.(5pts) For $x > 0$ let $f(x) = \int_1^{x^2} \frac{1}{t} dt$. Find $\frac{df}{dx}$.

- (a) $\frac{2}{x}$ (b) $2x \ln x$ (c) f is not differentiable (d) $\frac{2x}{\ln x}$ (e) $2x$

6.(5pts) Calculate $\lim_{x \rightarrow 3} \frac{x^2 + 9}{x^3 + 18}$.

- (a) $\frac{1}{5}$ (b) $\frac{2}{9}$ (c) $\frac{1}{3}$ (d) $\frac{2}{5}$ (e) $\frac{2}{3}$

7.(5pts) Calculate $\lim_{x \rightarrow 3} \frac{e^x - e^3}{\ln(4 - x)}$.

- (a) $-\infty$ (b) $-e^3$ (c) e^{-3} (d) ∞ (e) 0

8.(5pts) Calculate $\int_0^1 \frac{e^x}{e^{2x} + 1} dx$.

- (a) $\arctan(e) - \frac{\pi}{4}$ (b) $\ln(e^2 + 1) - \ln(2)$ (c) 1 (d) 2 (e) $\cot(e^2 + 1) - \cot(2)$

9.(5pts) Calculate $\frac{d}{dx} \arcsin(x^2)$

- (a) $\frac{2}{x\sqrt{1-x^4}}$ (b) $\frac{x^2}{1+x^2}$ (c) $\frac{2x}{\sqrt{1-x^4}}$ (d) $\frac{1}{\sqrt{1-x^4}}$ (e) $\frac{2x}{\sqrt{1-x^2}}$

10.(5pts) Calculate $\int_{-3}^{-2} \frac{dx}{x\sqrt{x^2-1}}$.

- (a) 7 (b) $\arcsin(3) - \arcsin(2)$ (c) $\arctan(-2) - \arctan(-3)$
(d) $e^{-2} - e^{-3}$ (e) $\operatorname{arcsec}(2) - \operatorname{arcsec}(3)$

Partial Credit

11.(10pts) Consider the function $f(x) = \sqrt{1+x^2}$.

- a) Show that f is one to one on the domain $(0, \infty)$.
b) Find the slope of the tangent line to the graph of the inverse function f^{-1} at the point $(\sqrt{10}, 3)$.

12.(10pts) Find the derivative of the function

$$f(x) = \sqrt[3]{\frac{(x^2-1)^4 e^{\sin x}}{(x+1)^5}} .$$

13.(10pts) A certain bacteria culture, undergoing natural growth, doubles in size after 10 minutes. If there were 100 specimens at time $t = 0$, when will the number have increased to 3000 specimens? Express your answer using \ln 's where needed.

14.(10pts) Calculate $\lim_{x \rightarrow -\infty} \left(1 + \frac{x^2}{2}\right)^{\frac{1}{x^2}}$.

15.(10pts) Students sometimes feel that functions described by expressions like

$F(x) = \begin{cases} 0 & x \geq 0 \\ x^2 & x < 0 \end{cases}$ are not very natural. Consider the function

$$f(t) = \arcsin\left(\frac{t^2-1}{t^2+1}\right) - 2 \arctan t .$$

- a) Show that $f(t)$ is constant for $t \geq 0$.

b) Show $f(t)$ is not constant for $t < 0$.

Hint: Compute $\frac{df}{dt}$ carefully.

Name: _____

Instructor-section: _____

Math126, Test I

February 9, 1999

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for two hours.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 13 pages of the test.

Good Luck!

Please mark your answers with an X.

1.	(a)	(b)	(●)	(d)	(e)
2.	(a)	(●)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(●)
4.	(a)	(●)	(c)	(d)	(e)
5.	(●)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(●)	(e)
7.	(a)	(●)	(c)	(d)	(e)
8.	(●)	(b)	(c)	(d)	(e)
9.	(a)	(b)	(●)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(●)