

MATH 229
Review Sheet for Exam 3

1. Evaluate the following logarithms.

a. $\log_m m$

d. $\log_\pi \frac{1}{\pi^3}$

g. $\log_4 8$

j. $\log_8 2$

m. $\log \frac{1}{100000}$

p. $\log_3 25$

b. $\log_p p^5$

e. $\ln \frac{1}{e^8}$

h. $\log_9 27$

k. $\log_5(\log_3 3)$

n. $(\ln e)^7$

q. $\log_{16} 20$

c. $\ln \sqrt[4]{e}$

f. $\log_w \sqrt{w}$

i. $\log_2 16$

l. $\log_4(\log_9 81)$

o. $\log_7 15$

r. $\log_9 18$

2. Write each logarithmic equation in exponential form.

a. $\log_5 w = x$

d. $\ln(t + 3) = 5$

b. $\log_p 7 = a - 1$

e. $2 = \log_k v$

c. $\log m = n$

f. $n = \log_4 8$

3. Write each exponential equation in logarithmic form.

a. $6^x = y$

d. $x - 4 = 7^a$

b. $m^3 = x$

e. $10^{2w+5} = n$

c. $e^4 = y$

f. $x = w^y$

4. Use the properties of logarithms to expand each expression as much as possible.

a. $\ln \left(\frac{a^3 b^2}{\sqrt{cd^5}} \right)$

d. $\ln \frac{x^3 e^5}{10\sqrt{a}}$

b. $\log_2 \sqrt{\frac{a}{b^3 c^5}}$

e. $\log_3 \left(\frac{9\sqrt[3]{x}}{ab^3} \right)$

c. $\log \frac{x^2 \sqrt{y}}{1000z}$

f. $\log_5 \left(\frac{125}{a^2 b^3 \sqrt[4]{c}} \right)$

5. Solve each equation. Approximate solutions to 4 decimal places when necessary.

a. $2^{x+7} = 32$

d. $2^{5+3x} = 24$

b. $3^{2x-5} = \frac{1}{81}$

e. $5^{x+3} = 15$

c. $32^{3-2x} = \left(\frac{1}{4}\right)^{2x+9}$

f. $4e^{2x-3} = 17$

6. Fill in the missing parts of the table.

	Amount Invested	Method of Compounding	Annual Interest Rate	Accumulated Amount	Time (in years)
a.	\$4000	continuously	2.75%		6
b.	\$6500	monthly	7%		17
c.		continuously	6.5%	\$5000	15
d.		daily	4.25%	\$8800	7
e.	\$700	continuously	1.5%	\$1000	
f.	\$1350	quarterly	12%	\$2000	
g.	\$2400	continuously		\$3500	5
h.	\$1575	weekly		\$2300	3
i.	A_0	continuously	7.25%	double A_0	
j.	A_0	continuously	5.75%	triple A_0	
k.	A_0	continuously		double A_0	4
l.	A_0	continuously		triple A_0	14

7. Find the derivatives of the following functions.

$$\begin{array}{lll}
 \text{a. } f(x) = x^2 e^x & \text{b. } g(x) = \frac{e^x}{x^2} & \text{c. } h(u) = e^{-u^2} \\
 \text{d. } f(t) = t^2 e^{-2t} & \text{e. } f(x) = \frac{e^x + e^{-x}}{2} & \text{f. } g(x) = (2 - e^{8x})^{12} \\
 \text{g. } g(x) = \frac{\ln x}{x^2} & \text{h. } h(x) = \ln(x^3 - x) & \text{i. } f(t) = \ln(x - 3)^2 (x + 1)^7
 \end{array}$$

8. Use logarithmic differentiation to find the derivative of the following functions.

$$\begin{array}{ll}
 \text{a. } f(x) = (x^2 - 2)^4 (2x - 1)^3 & \text{b. } g(x) = x^2 (x - 1)^3 (x^2 + 4) \\
 \text{c. } h(x) = (x + 3)^2 \sqrt{3x - 2} & \text{d. } f(x) = 2^x
 \end{array}$$

9. Determine the intervals where $f(x) = e^{-\frac{x^2}{2}}$ is increasing or decreasing.

10. Find the intervals of concavity of $f(x) = x^2 + \ln x^2$.

11. Use the second derivative test to find any relative extrema of $f(x) = \ln(x^2 + 1)$

12. Find an equation of the tangent line to $f(x) = x^2 e^{-\frac{x^2}{2}}$ at the point $(1, \frac{1}{\sqrt{e}})$.

13. Find an equation of the tangent line to $g(x) = \ln(2x^3 + 1)$ at the point $(1, \ln 3)$.

14. Evaluate the following indefinite integrals.

$$\begin{array}{lll}
 \text{a. } \int x^3 dx & \text{b. } \int \frac{1}{\sqrt[3]{x^2}} dx & \text{c. } \int (3e^x - \frac{1}{x} + 3x^2) dx \\
 \text{d. } \int \frac{3}{x^4} dx & \text{e. } \int 8 dx & \text{f. } \int (x + \frac{1}{x}) dx
 \end{array}$$

15. Find $f(x)$ by solving the initial value problem.
- a. $f'(x) = 3x^2 - x$, $f(1) = \frac{3}{2}$ b. $f'(x) = e^x - 4x^3$, $f(0) = 3$
c. $f'(x) = 2x + \frac{1}{x}$, $f(1) = -3$
16. Page 901 problem 3.
17. Find the area of the region under the graph of the function f on the interval $[a, b]$.
- a. $f(x) = x^2$; $[0, 4]$ b. $f(x) = e^x - x$; $[1, 2]$
c. $f(x) = x + 3$; $[0, 2]$ d. $f(x) = \frac{1}{\sqrt{x}}$; $[1, 9]$
18. Evaluate the following definite integrals.
- a. $\int_1^4 (2x - 3)dx$ b. $\int_{-1}^3 x^2 dx$ c. $\int_1^4 (x + \frac{1}{x})dx$
d. $\int_1^8 2x^{1/3}$ e. $\int_{-2}^2 (x^2 + 1)dx$ f. $\int_1^2 (1 + \frac{1}{x} + \frac{1}{x^2})$
19. Find the average value of the following functions over the given interval.
- a. $f(x) = 3x - 1$; $[1, 3]$ b. $f(x) = e^x + x$; $[0, 3]$ c. $f(x) = x^4 - 2x^2 + x$; $[-1, 1]$
20. Find the area of the region bounded below by the graph of each function and above by the x -axis from $x = a$ to $x = b$.
- a. $f(x) = x^2 - 4$; $a = -2$, $b = 2$ b. $f(x) = -\sqrt{x}$; $a = 0$, $b = 4$
21. Sketch the graphs of the functions f and g and find the area of the region enclosed by these graphs between the vertical lines $x = a$ to $x = b$.
- a. $f(x) = 2x - 4$; $g(x) = x^2 - 4$; $a = 0$, $b = 2$
b. $f(x) = -x^2 + 2x + 3$; $g(x) = -x + 3$; $a = 0$, $b = 2$
c. $f(x) = x^2 + 1$; $g(x) = \frac{1}{3}x^3$; $a = -1$, $b = 2$
d. $f(x) = 9 - x^2$; $g(x) = 2x + 3$; $a = -1$, $b = 2$
22. Sketch the graph and find the area of the region completely enclosed by the graphs of f and g .
- a. $f(x) = x^3$ and $g(x) = x^2$ b. $f(x) = x^3$ and $g(x) = x$
c. $f(x) = 9 - x^2$; $g(x) = -3x + 3$
23. page 949-950 #3, 5, 7
24. page 950 #11, 12, 16, 17