MATH 230 NAME:
(6.2, 6.3)

Directions: Show all work on a separate sheet of paper for full credit.

1. Use the Laws of Logarithms to expand the quantity $\ln \sqrt[3]{\frac{x-1}{x+1}}$.

2. Express the quantity as a single logarithm: $2\ln(x) + 3\ln(y) - \ln(z)$.

3. Simplify the expression $e^{\ln(\ln(e^3))}$.

4. Find the limit.

   a) $\lim_{x\to\infty} e^{-x^2}$

   b) $\lim_{x\to\infty} e^{-2x}\cos(x)$

   c) $\lim_{x\to\infty} [\ln(2+x) - \ln(1+x)]$

5. Differentiate the function.

   a) $f(x) = x\ln(x) - x$

   b) $f(x) = \sin(\ln(x))$

   c) $f(x) = \ln(\sin^2(x))$

   d) $f(y) = \ln \frac{(2y+1)^5}{\sqrt{y^2+1}}$ (Hint: try to expand using laws of logarithms first)

   e) $f(x) = \ln(\ln(\ln(x)))$

   f) $f(x) = \ln(\csc(x) - \cot(x))$

   g) $f(x) = e^x + x^e$

   h) $y = \frac{e^x}{1-e^x}$

   i) $f(t) = \sin(e^{3t^2})$

   j) $f(x) = e^{x\sin(2x)}$

   k) $f(x) = x^2 e^{-1/x}$

6. Use logarithmic differentiation to differentiate

   a) $y = (x^2+2)^2(x^4+4)^4$

   b) $y = \sqrt{\frac{x-1}{x^4+1}}$

7. Evaluate the integral.

a) $\displaystyle\int_0^3 \frac{dx}{5x+1}dx$

b) $\displaystyle\int_4^9 \left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2 dx$

c) $\displaystyle\int \frac{dx}{x\ln(x)}$

d) $\displaystyle\int \frac{\cos(\ln(t))}{t}dt$

e) $\displaystyle\int_0^1 (x^e + e^x)dx$

f) $\displaystyle\int e^{\tan(x)}\sec^2(x)dx$

g) $\displaystyle\int \frac{(1+e^x)^2}{e^x}dx$