TO: Calculus BC students

FROM: Mrs. Kidder

I have enclosed a worksheet with 12 derivative problems and 13 integral problems to help you get warmed up for next school year. I also included a copy of the table of derivatives and integrals (from last year) that you need to have memorized.

Please have all 25 problems attempted for the first day of school. I will check to see that you attempted them and you will have time in class to compare answers and discuss them. They will be collected and graded as well.

Have a great summer!

Mrs. Kidder

CALC BC

Worksheet on Derivatives & Integrals

NAME

A. Find the derivative. When appropriate, use implicit or logarithmic differentiation.

(1) $y = \dfrac{e^x}{\ln x}$

(2) $y = e^{\ln(x^3+1)}$

(3) $y = \ln(\cos e^x)$

(4) $y = 3^{x\tan x}$

(5) $y = e^{5x} + (5x)^e$

(6) $y = e^{3x}(1+e^{-x})^2$

(7) $x^4 + e^{xy} - y^2 = 20$

(8) $y = (\sqrt{2})^{x\ln x}$

(9) $y = (\ln x^2)^3$

(10) $y = (x^2+3)^{\ln x}$

(11) $y = \pi^x \cdot x^3$

(12) $y = (\ln x)^{\tan x}$

B. Integrate each. [Don't forget "+c"]

(13) $\int (x^2+4)^2 dx$

(14) $\int \frac{\sec^2 x}{2+3\tan x} dx$

(15) $\int \frac{dx}{x \ln x}$

(16) $\int \tan(\pi/4 - x) dx$

(17) $\int \frac{dx}{\sqrt{2x+1}}$

(18) $\int \frac{x^3+2x-1}{x} dx$

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

(20) $\int \frac{dx}{x\sqrt{9x^2-1}}$

(21) $\int \cot^2 x\, dx$

Hint: Use $\cot^2 x + 1 = \csc^2 x$

(22) $\int \frac{e^x - 2}{e^{2x}} dx$

(23) $\int \frac{e^{2x}\, dx}{e^{4x}+1}$

(24) $\int x\sqrt{x+2}\, dx$

(25) $\int \frac{8\, dx}{\sqrt{4-x^2}}$

* Graded Assignment - Due: 1st Day of School

VIII: Derivative Rules

$\frac{d}{dx}[\text{constant}] = 0$

$\frac{d}{dx}[x^n] = nx^{n-1}$

$\frac{d}{dx}[u^n] = nu^{n-1} \cdot \frac{du}{dx}$
{where "u" = quantity in terms of "x"}

$\frac{d}{dx}[\sin u] = \cos u \cdot \frac{du}{dx}$

$\frac{d}{dx}[\cos u] = -\sin u \cdot \frac{du}{dx}$

$\frac{d}{dx}[\tan u] = \sec^2 u \cdot \frac{du}{dx}$

$\frac{d}{dx}[\cot u] = -\csc^2 u \cdot \frac{du}{dx}$

$\frac{d}{dx}[\sec u] = \sec u \tan u \cdot \frac{du}{dx}$

$\frac{d}{dx}[\csc u] = -\csc u \cot u \cdot \frac{du}{dx}$

$\frac{d}{dx}[\ln u] = \frac{1}{u} \cdot \frac{du}{dx}$

$\frac{d}{dx}[e^u] = e^u \cdot \frac{du}{dx}$

$\frac{d}{dx}[a^u] = a^u \ln a \cdot \frac{du}{dx}$
{where a = constant}

$\frac{d}{dx}[\sin^{-1} u] = \frac{1}{\sqrt{1-u^2}} \cdot \frac{du}{dx}$

$\frac{d}{dx}[\tan^{-1} u] = \frac{1}{1+u^2} \cdot \frac{du}{dx}$

$\frac{d}{dx}[\sec^{-1} u] = \frac{1}{|u|\sqrt{u^2-1}} \cdot \frac{du}{dx}$

$\frac{d}{dx}[\cos^{-1} u] = -\frac{d}{dx}[\sin^{-1} u]$

$\frac{d}{dx}[\cot^{-1} u] = -\frac{d}{dx}[\tan^{-1} u]$

$\frac{d}{dx}[\csc^{-1} u] = -\frac{d}{dx}[\sec^{-1} u]$

Methods

Product Rule –
$d/dx[fg] = fg' + gf'$

Quotient Rule –
$d/dx[f/g] = \frac{gf' - fg'}{g^2}$

Chain Rule –
$\frac{d}{dx}[f(g(x))] = f'(g(x)) \cdot g'(x)$

$\frac{d}{dx}[\log_b(u)] = \frac{d}{dx}\left[\frac{\ln u}{\ln b}\right] = \frac{1}{\ln b} \cdot \frac{1}{u} \cdot \frac{du}{dx}$

IX. INTEGRAL RULES

$\int 1dx = \int dx = x + c$

$\int a\,dx = a\int dx = ax + c$

$\int u^n\,du = \frac{1}{n+1} u^{n+1} + C$
{where u = quantity in terms of x}
<where $n \neq -1$>

$\int \frac{du}{u} = \ln|u| + c$

$\int e^u\,du = e^u + c$

$\int a^u\,du = \frac{a^u}{\ln a} + c$

$\int \sin u\,du = -\cos u + C$

$\int \cos u\,du = \sin u + c$

$\int \tan u\,du = \begin{cases} -\ln|\cos u| + c \\ \ln|\sec u| + c \end{cases}$

$\int \cot u\,du = \ln|\sin u| + c$

$\int \sec u\,du = \ln|\sec u + \tan u| + c$

$\int \csc u\,du = -\ln|\csc u + \cot u| + c$

$\int \sec u \tan u\,du = \sec u + c$

$\int \csc u \cot u\,du = -\csc u + C$

$\int \sec^2 u\,du = \tan u + c$

$\int \csc^2 u\,du = -\cot u + C$

$\int \frac{du}{\sqrt{1-u^2}} = \sin^{-1}(u) + c$

$\int \frac{du}{1+u^2} = \tan^{-1}(u) + c$

$\int \frac{du}{u\sqrt{u^2-1}} = \sec^{-1}|u| + c$

$\int \frac{du}{\sqrt{a^2-u^2}} = \sin^{-1}\left(\frac{u}{a}\right) + c$

$\int \frac{du}{a^2+u^2} = \frac{1}{a}\tan^{-1}\left(\frac{u}{a}\right) + c$

$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\sec^{-1}\left|\frac{u}{a}\right| + c$