MATH 131
Quiz IX
November 24, 1992

Name ___Key___

1. Find the derivative of each of the following:

a. $y = \ln x + e^{2x} - 7x$

$\frac{dy}{dx} = \frac{1}{x} + e^{2x} \cdot 2 - 7 = \frac{1}{x} + 2e^{2x} - 7$

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(most missed $e^{2x} \cdot 2$)

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b. $f(x) = \ln(1+x^2)$

$\frac{1}{1+x^2} \cdot 2x = \frac{2x}{1+x^2}$

c. $y = \sqrt{e^x - x} = (e^x - x)^{1/2}$

$\frac{dy}{dx} = \frac{1}{2}(e^x - x)^{-1/2}(e^x - 1) = \frac{e^x - 1}{2\sqrt{e^x - x}}$

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2. Solve for x: $e^{-2x} = 3$

$e^{-2x} = \ln 3 \quad x = -\frac{1}{2}\ln 3$

3. Integrate the following:

a. $\int \frac{1}{3x+2}\,dx = \frac{1}{3}\ln(3x+2) + c$

$u = 3x+2$
$du = 3dx$

or

$\int \frac{1}{3}\frac{1}{u}\,du = \frac{1}{3}\ln u + c$
$= \frac{1}{3}\ln(3x+2) + c$

b. $\int e^{2x} + x\,dx$ (sum made subs hard)
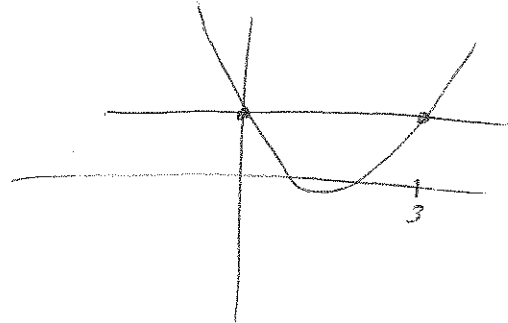
$\frac{1}{2}e^{2x} + \frac{x^2}{2} + c$

c. $\int_1^2 \frac{\ln x}{x}\,dx$. Hint: let u = ln x.

$u = \ln x$
$du = \frac{1}{x}dx$

$= \int_{\ln 1}^{\ln 2} \frac{1}{u}\,du = \frac{u^2}{2}\Big|_{\ln 1}^{\ln 2}$

$= \frac{(\ln 2)^2}{2} - \frac{(\ln 1)^2}{2}$

$= \frac{(\ln 2)^2}{2}$

4. Find the area between the curves $y = x^2 - 3x + 1$, and $y = 1$.

$x^2 - 3x + 1 = 1$
$x^2 - 3x = 0$
$x(x-3) = 0$

$\int_0^3 1 - (x^2 - 3x + 1)\,dx$

$= \int_0^3 -x^2 + 3x\,dx$

$= -\frac{x^3}{3} + \frac{3x^2}{2}\Big|_0^3$

$= -\frac{3^3}{3} + \frac{3(9)}{2} - 0$

$= -9 + \frac{27}{2} = \frac{9}{2}$