

u-sub lesson # 2 CW.

Differentiate:

$$f(x) = e^{2x} \cdot \ln x$$

$$f(x) = \ln(x\sqrt{x^2+1})$$

$$f(x) = e^{5/x^2}$$

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

Integrate:

$$\int \frac{x+1}{x^2+2x} dx$$

$u = x^2+2x \quad du = (2x+2)dx$

$$\int \frac{1}{2} \frac{du}{u}$$

$$\frac{1}{2} \ln u = \frac{1}{2} \ln(x^2+2x) + C$$

$$\int_{-1}^1 \frac{1}{x+2} dx$$

$u = x+2 \quad du = 1$

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

$$\ln(1+2) - \ln(-1+2)$$

$$\ln\left(\frac{3}{1}\right) = \ln 3$$

$$\int \sqrt[3]{x^5} dx$$

$$\int x^{5/3} dx$$

$$\frac{3}{8} x^{8/3} + C$$

$$\int_0^2 x^2 e^{-x^3} dx$$

$u = -x^3 \quad du = -3x^2 dx$

$$\int -\frac{1}{3} e^u du$$

$$-\frac{1}{3} e^{(-x^3)^2} \Big|_0^2 = \left(-\frac{1}{3} e^{(-2)^3}\right) + \left(\frac{1}{3} e^{(-0)^3}\right)$$

$$\frac{1}{3} - \frac{1}{3} e^{-8}$$

$$\int \frac{x^3 - 2x}{\sqrt{x}} dx$$

$$\int \frac{x^3}{x^{1/2}} - \frac{2x}{x^{1/2}} dx$$

$$\int x^{5/2} - 2x^{1/2} dx$$

$$\frac{2}{7} x^{7/2} - \frac{4}{3} x^{3/2} + C$$

$$\int \frac{1}{x^7} dx$$

$$\int (x)^{-7} dx$$

$$-\frac{1}{6} x^{-6} + C$$

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

$u = 1+2e^x \quad du = 2e^x dx$

$$\int \frac{1}{2} \frac{du}{u}$$

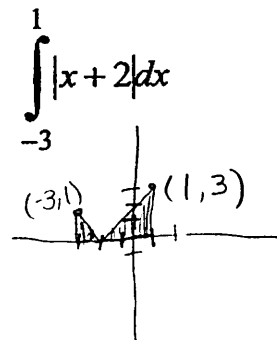
$$\frac{1}{2} \ln u = \frac{1}{2} \ln(1+2e^x) + C$$

$$\int \frac{(\ln x)^4}{x} dx$$

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

$$\int (u)^4 du$$

$$\frac{1}{5} u^5 = \frac{1}{5} (\ln x)^5 + C$$



$$\frac{1}{2}(1)(1) + \frac{1}{2}(3)(3) = \frac{1}{2} + \frac{9}{2} = \frac{10}{2} = 5$$

U-Sub Lesson 3

Integrate

1 $\int x^3(2x^4+5)^3 dx$ $u=2x^4+5$
 $\frac{du}{dx} = \frac{8x^3}{8} dx$
 $\int \frac{1}{8} u^3 du$
 $\frac{1}{32} (2x^4+5)^4 + C$

2 $\int \frac{5}{x^5} dx$ $\int 5x^{-5}$
 $-\frac{5}{4} x^{-4} + C$

3 $\int \frac{x}{\sqrt{9-x^2}} dx$ $u=9-x^2$
 $\frac{du}{dx} = \frac{-2x}{2} dx$
 $\int -\frac{1}{2} u^{-1/2} du$
 $-(9-x^2)^{1/2} + C$

4 $\int \frac{(\ln x)^3}{x} dx$ $u=\ln x$
 $du = \frac{1}{x} dx$
 $\int u^3 du$
 $\frac{1}{4} (\ln x)^4 + C$

5 $\int \frac{x^4-3x^3+2}{x} dx$ $\int x^3-3x^2+\frac{2}{x}$
 $\frac{x^4}{4} - x^3 + 2\ln x + C$

6 $\int \sqrt{x^5} dx$ $\int x^{5/2} dx$
 $\frac{2}{7} x^{7/2} + C$

7 $\int_0^2 x(x^2+1)^3 dx$
 $u=x^2+1$
 $\frac{du}{dx} = \frac{2x}{2} dx$
 $\int_0^2 \frac{1}{2} u^3 du$
 $\frac{1}{8} (x^2+1)^4 \Big|_0^2 = 78$

8 $\int_0^{\pi/8} \sin^5 2x \cos 2x dx$ $u=\sin 2x$
 $\frac{du}{dx} = \frac{2 \cos 2x}{2} dx$
 $\int_0^{\pi/8} \frac{1}{2} u^5 du$
 $\frac{1}{2} (\sin 2x)^6 \Big|_0^{\pi/8} = \frac{1}{96}$

Express each definite integral in terms of u , but do not evaluate.

1) $\int_{-1}^0 \frac{8x}{(4x^2+1)^2} dx; u=4x^2+1$

$$\int_5^1 u^{-2} du$$

2) $\int_0^1 -12x^2(4x^3-1)^3 dx; u=4x^3-1$

$$\int_{-1}^3 -u^3 du$$

3) $\int_{-1}^2 6x(x^2-1)^2 dx; u=x^2-1$

$$\int_0^3 3u^2 du$$

4) $\int_0^1 \frac{24x}{(4x^2+4)^2} dx; u=4x^2+4$

$$\int_4^8 \frac{3}{u^2} du$$