November 18

SWBAT:
Find the integral using u-substitution

$$\int_1^3 \frac{1}{x}+2x\,dx =$$

$$\ln x + x^2 + c \Big|_1^3$$

$$\ln(3)+3^2+c-(\ln(1)+1^2+c)$$

$$\ln(3)-\ln(1)+8$$

$\int 3(x^2+7)^2(2x)dx$

① pick u

$u = x^2+7$

② find the differentials of both sides

$du = 2x\,dx$

③ solve for dx

$\frac{du}{2x} = dx$

④ substitute

$\int 3(x^2+7)^2(2x)dx$

$\int 3u^2(2x)\frac{du}{2x}$

⑤ Simplify + Integrate

$\int 3u^2 du = u^3 + C$

⑥ sub u back in

$(x^2+7)^3 + C$

$\int \frac{\ln x}{3x}dx$

$u = \ln x$

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

$x\,du = dx$

$\int \frac{u}{3x}\cdot x\,du$

$= \int \frac{u}{3}du = \frac{1}{3}\int u\,du$

$= \frac{1}{3}\cdot\frac{u^2}{2} + C$

$= \frac{1}{6}\ln(x)^2 + C$

$$\int \frac{x\cos(x^2+3)}{\sqrt{\sin(x^2+3)}}\,dx$$

$$= \sqrt{\sin(x^2+3)} + C$$

$$u = x^2+3$$

$$du = 2x\,dx$$

$$\frac{du}{2x} = dx$$

$$\int \frac{x\cos(u)}{\sqrt{\sin(u)}}\,\frac{du}{2x}$$

$$\int \frac{\cos(u)}{2\sqrt{\sin(u)}}\,du$$

$$w = \sin(u)$$

$$dw = \cos(u)\,du$$

$$\frac{dw}{\cos(u)} = du$$

$$\int \frac{\cos(u)}{2\sqrt{w}}\cdot\frac{dw}{\cos(u)} = \int \frac{1}{2\sqrt{w}}\,dw$$

$$= \frac{1}{2}\int w^{-1/2}\,dw = \frac{1}{2}\,\frac{w^{1/2}}{\frac{1}{2}} + C = w^{1/2} + C$$

$$= \sqrt{w} + C = \sqrt{\sin u} + C$$

$$u = \sin(x^2+3)$$

$$du = 2x\cos(x^2+3)\,dx$$

$$\frac{du}{2x\cos(x^2+3)} = dx$$

$$\int \frac{x\cos(x^2+3)}{\sqrt{u}}\cdot\frac{du}{2x\cos(x^2+}$$

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

$$\int \tan x\,dx$$

$$\int \frac{\sin x}{\cos x}\,dx$$

$$u = \sin x$$

$$du = \cos x\,dx$$

$$\frac{du}{\cos x} = dx$$

$$\int \frac{u}{\cos x}\cdot\frac{du}{\cos x}$$

$$\int \frac{u}{\cos^2 x}\,du$$

$$\int \frac{\sin x}{\cos x}\,dx$$

$$u = \cos x$$

$$du = -\sin x\,dx$$

$$\frac{du}{-\sin x} = dx$$

$$\int \frac{\sin x}{u}\cdot\frac{du}{-\sin x}$$

$$= \int -\frac{1}{u}\,du$$

$$= -\ln|u| + C$$

$$= -\ln|\cos x| + C$$

$\int e^{5x}\,dx$

$u = 5x$

$du = 5\,dx$

$\frac{du}{5} = dx$

$\int e^u \cdot \frac{du}{5} = \frac{1}{5}\int e^u\,du$

$= \frac{1}{5}e^u + C = \frac{1}{5}e^{5x} + C$

$\int 8x\sec^2(x^2)e^{\tan(x^2)}\,dx$

$u = \tan(x^2)$

$du = \sec^2(x^2)(2x)\,dx$

$\frac{du}{\sec^2(x^2)(2x)} = dx$

$\int 8x\sec^2(x^2)e^u \cdot \frac{du}{\sec^2(x^2)(2x)} = \int 4e^u\,du$

$= 4e^u + C$

$= 4e^{\tan(x^2)} + C$

Assignment 7

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(multiples of 3)

(skip 15)