October 8

How do you know when you will need to use a u-substitution?

How can you choose what "u" is?

October 8

Students will verbally explain how to evaluate indefinite integrals

(using the words:
antiderivative, constant, substitution...)

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

$u = x^2+3$

$du = 2x \cdot dx$

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

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

$w = \sin u$

$dw = \cos u \cdot du$

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

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

$$\int \tfrac{1}{2}w^{-\frac{1}{2}}\,dw = \frac{\frac{1}{2}w^{\frac{1}{2}}}{\frac{1}{2}}+c$$

$$= \sqrt{w}+c = \sqrt{\sin(u)}+c =$$

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

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

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

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

$$\int \frac{1}{2\sqrt{u}}du = \int \tfrac{1}{2}u^{-\frac{1}{2}}\,du$$

$$= \frac{\frac{1}{2}u^{\frac{1}{2}}}{\frac{1}{2}}+c = \sqrt{u}+c =$$

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

$$\int \frac{1}{1+9x^2}dx$$

$u = 9x^2$

$du = 18x\ dx$

$\frac{du}{18x} = dx$

$$\int \frac{1}{1+u}\frac{du}{18x}$$

$u = 1+9x^2$

$du = 18x\,dx$

$\frac{du}{18x} = dx$

$$\int \frac{1}{u}\frac{du}{18x}$$

try again

$$\int \frac{1}{1+9x^2}dx$$

$$\int \frac{1}{1+x^2}dx = \tan^{-1}(x)+C$$

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

$u = 3x$

$du = 3\,dx$

$\frac{du}{3} = dx$

$$\int \frac{1}{(1+u^2)}\frac{du}{3} = \frac{1}{3}\int \frac{1}{1+u^2}du = \frac{1}{3}\tan^{-1}(u)+C = \frac{1}{3}\tan^{-1}(3x)+C$$

$$\int \frac{1}{\sqrt{16-x^2}}\,dx$$

$$\int \frac{1}{\sqrt{1-x^2}}\,dx = \sin^{-1}(x)+C$$

$$\int \frac{1}{\sqrt{16\left(1-\frac{x^2}{16}\right)}}\,dx = \int \frac{1}{\sqrt{16}}\cdot\frac{1}{\sqrt{1-\frac{x^2}{16}}}\,dx$$

$$= \frac{1}{4}\int \frac{1}{\sqrt{1-\frac{x^2}{16}}}\,dx = \frac{1}{4}\int \frac{1}{\sqrt{1-\left(\frac{x}{4}\right)^2}}\,dx$$

$$u = \frac{x}{4} = \frac{1}{4}x$$

$$du = \frac{1}{4}\,dx$$

$$4du = dx$$

$$\frac{1}{4}\int \frac{1}{\sqrt{1-u^2}}\,4du$$

$$= \frac{1}{4}(4)\int \frac{1}{\sqrt{1-u^2}}\,du = \sin^{-1}(u)+C$$

$$= \sin^{-1}\left(\frac{x}{4}\right)+C$$

$$\int \frac{x}{(x-3)^5}\,dx$$

$u = x-3 \longrightarrow x = u+3$

$du = 1\,dx$

$du = dx$

$$\int \frac{x}{u^5}\,du = \int \frac{u+3}{u^5}\,du$$

$$= \int \frac{u}{u^5}+\frac{3}{u^5}\,du$$

$$= \int \frac{1}{u^4}+\frac{3}{u^5}\,du = \int u^{-4}+3u^{-5}\,du$$

$$= \frac{u^{-3}}{-3}+\frac{3u^{-4}}{-4}+C$$

$$= \frac{(x-3)^{-3}}{-3}+\frac{3(x-3)^{-4}}{-4}+C$$

Set 10:

Pg 281 #9 - 28

Set 11:

Pg 333 #3-72 (multiples of 3)