

## 6.2 Day 3

### Choosing $u$

What did we see in our homework as ideas of typical parts of a function to replace with  $u$ ?

- Exponents
- Parenthesis
- Denominators
- Radicands

Are these the only things? No - but they are a good place to start when choosing for yourself.

If it doesn't work out - don't worry. Try something else!

## Ex: Trig Integrals & Substitution

Evaluate  $\int \cot 7x \, dx = \int \frac{\cos 7x}{\sin 7x} \, dx = \frac{1}{7} \int \frac{1}{\sin 7x} \cdot 7 \cos 7x \, dx$

let  $u = \sin 7x$

$du = 7 \cos 7x \, dx$

$$= \frac{1}{7} \int \frac{1}{u} \, du$$

$$= \frac{1}{7} \ln |u| + C$$

$$\boxed{\frac{1}{7} \ln |\sin 7x| + C}$$

**Evaluate.**

$$\text{a. } \int \frac{dx}{\cos^2 2x} = \int \frac{1}{\cos^2 2x} dx = \frac{1}{2} \int \sec^2 2x \cdot 2 dx$$

$$\text{Let } u = 2x \qquad = \frac{1}{2} \int \sec^2 u \, du$$

$$du = 2 dx$$

$$= \frac{1}{2} \tan u + C$$

$$\boxed{= \frac{1}{2} \tan 2x + C}$$

$$\text{b. } \int \cot^2 3x \, dx = \frac{1}{3} \int (\csc^2 3x - 1) \, dx \cdot 3$$

$$\text{Let } u=3x \quad = \frac{1}{3} \int \csc^2 u - 1 \, du$$

$$du=3dx \quad = \frac{1}{3} \cdot -\cot u - u + C$$

$$= -\frac{1}{3} \cot 3x - 3x + C$$

$$\begin{aligned} \text{c. } \int \cos^3 x \, dx &= \int (\cos^2 x) \cos x \, dx \\ &= \int (1 - \sin^2 x) \cos x \, dx \end{aligned}$$

$$\begin{aligned} \text{Let } u &= \sin x \\ du &= \cos x \, dx \end{aligned}$$

$$= \int 1 - u^2 \, du$$

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

$$\boxed{= \sin x - \frac{\sin^3 x}{3} + C}$$

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