Recall *u*-substitution technique:

Last Time:

$\int \sqrt{1+x^2}\ x\, dx$ versus $\int \sqrt{1+x}\ x\, dx$

Do: $\int e^{5x} dx$

Do: $\int \sin 9x\ dx$

Naturally, *u*-sub does not work in every situation.

Recall: Derivative Product Rule

$$[f \cdot g]' = f' \cdot g + f \cdot g'$$

then

Another Tool: Integration by Parts (IBP)

one function will become _____________

and the other function will be ____________________________________, label it _____________

ex. $\int xe^{x}dx$

IBP Formula:

$$\int u\ dv = uv - \int v\ du$$

ex. $\int xe^{3x}dx$

ex. $\int x \sin x \, dx$

$$\int u \, dv = uv - \int v \, du$$

Going forward, the challenge will be to decide ____.

Do: $\int x \sin x^2 \, dx$

Do: $\int x \sin(2x) \, dx$

Needing to Use IBP More Than Once:

ex. $\int t^2 e^t \, dt$

When power function isn't *u*:

ex. $\int x^5 \ln x \, dx$