MATH 122

SUBSTITUTION

GOALS

- ☐ KNOW HOW TO USE SUBSTITUTION FOR BOTH INDEFINITE AND DEFINITE INTEGRALS
- ☐ RECOGNIZE HELPFUL VS. UNHELPFUL SUBSTITUTION CHOICES

SUBSTITUTION IS LIKE A REVERSE _____

CHAIN RULE: $\frac{d}{dx}\left(f(g(x))\right) =$

e.g. $y = \sin(x^4)$

How would we compute $\int 4x^3 \cos(x^4)\,dx$?

LET $u =$ ← GOOD STARTING POINT IS TO CHOOSE $u =$

GOAL:

Ex: $\int 6x\left(2x^2+1\right)^4 dx$

LET $u =$

TAKE DERIV:

$\frac{du}{dx} =$

OPTION 1:

OPTION 2:

Ex: $\int \frac{4x}{1+x^2} dx$

Ex: $\int \frac{4x}{1+x^4}\,dx$

TRY: $\int \frac{x^2}{\sqrt{1-x^6}}\,dx =$

Ex: $\int 4x\sqrt{x+2}\,dx =$

DEFINITE INTEGRALS

Ex: $\int_0^{\sqrt{\pi}} x \sin(x^2)\, dx$

OPTION 1:

OPTION 2:

Ex $\int_1^{e^3} \frac{(\ln x)^2}{x}\, dx$

Ex: $\int \frac{x}{\sqrt{3 - x^4}} \, dx$