

Reassessing I5

I5: I can evaluate integrals using the substitution method.

Where topic was first introduced: Module 14

Favorite Mistakes:

- +C
- not checking work with the derivative
- not being solid on short cut rules
- for definite integrals mixing x bounds with a u integral (This is the number one mistake students make!!!)
- trying to integrate when you have both x and u in the integral
- factoring out an x in front of the integral
- translating back to x BEFORE taking the antiderivative

Example:

18) $\int \cos(x) e^{\sin(x)} dx$

not basic

let $u = \sin(x)$
 $du = \cos(x) dx$

$$\int \cos(x) e^{\sin(x)} dx = \int e^u du = e^u + C = e^{\sin(x)} + C$$

Remember that you can start by picking anything for u - if you pick wrong, you just get extra derivative practice!!!

Definite integrals:

$$\int_0^2 \frac{3x}{\sqrt{5x^2 + 7}} dx$$

Let $u = 5x^2 + 7$ then $du = 10x dx \implies \frac{du}{10} = x dx$ and if $x = 0$, $u(0) = 5(0)^2 + 7 = 7$ and if $x = 2$, $u(2) = 5(2)^2 + 7 = 27$

$$\text{Then } \int_0^2 \frac{3x}{\sqrt{5x^2 + 7}} dx = \frac{3}{10} \int_7^{27} \frac{1}{\sqrt{u}} du = \frac{3}{10} \int_7^{27} u^{-1/2} du = \frac{3}{10} 2u^{1/2} \Big|_7^{27} = \frac{3}{5} (\sqrt{27} - \sqrt{7}) \approx 1.53$$

Prepare for Reassessment:

(check your answers with Desmos!)

1. $\int \frac{\cos(x)}{1 + \sin^2(x)} dx$

2. $\int x \sin(3x^2) dx$

3. $\int \frac{r^2}{r^3 + 1} dr$

4. $\int (4t^3 + 2)(\cos(t^4 + 2t)) dt$

WATCH the BOUNDS!!!! Never mix x with u !!!!!!

5. $\int_0^{\pi/3} \frac{\sin(\theta)}{\cos^2(\theta)} d\theta$

6. $\int_{\pi^2/16}^{\pi^2/9} \frac{\sec^2 \sqrt{x}}{\sqrt{x}} dx$

7. $\int_0^a x\sqrt{a^2 - x^2} dx$