Section 5.5. day one (ending)

5. Compute 
$$\int \frac{\arctan(x)}{1+x^2} dx = \int u \cdot du = \frac{u^2}{2} + c = \frac{\left(\arctan(x)\right)^2}{2} + c$$

•  $u = \arctan(x)$ 

· du = (1 dx

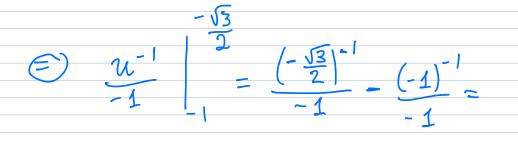
6. Compute 
$$\int \frac{x^3}{\sqrt{1-x^4}} dx = \int \frac{2}{\sqrt{1-x^4}} dx = \int \frac{2}{\sqrt{1-x^4}} dx = \int \frac{1}{\sqrt{1-x^4}} dx = \int \frac{1}{$$

8. Compute  $\int_0^{\pi/6} \frac{\sin(t)}{(\cos(t))^2} dt$  two ways: (1) by computing the antiderivative using substitution and then using FTC2 to evaluate using the original bounds; (2) by substituting and changing the bounds to match the substitution.

Find the substitution.

Sin(t) 
$$\frac{1}{2}$$
  $\frac{1}{2}$   $\frac{1$ 

UAF Calculus I



$$= -\left(-\frac{13}{2}\right)^{-1} + \left(-1\right)^{-1} = \frac{2}{\sqrt{3}} - 1$$

## SECTION 5-5: SUBSTITUTION (DAY 2)

1. Compute 
$$\int \frac{\sec^2(x)}{\tan(x)} dx = \int \frac{1}{\tan(x)} \frac{du}{2 \cdot x \cdot \tan(x)} = \frac{1}{2} \int \frac{du}{u-1} = \frac{1}{2} \int \frac{du}{u-1}$$

=  $\frac{1}{2} \ln |u-1|+C + \frac{1}{2} \ln |Sec^2(x)-1|+C$ 

3. Compute 
$$\int \frac{\sin(\theta)}{1+\cos(\theta)} d\theta$$

## Verification:

$$\left(\frac{1}{2}\ln|\operatorname{Sec}^2(x)-1|\right)^2$$

= 
$$\frac{1}{2}$$
  $\frac{1}{\text{Sec}^2(x)-1}$   $\frac{1}{2}$   $\frac{1}{2}$ 

$$= \frac{1}{\operatorname{Sec}^{2}(x)-1} \cdot \operatorname{Sec}^{2}(x) \cdot \tan(x) =$$

$$= \frac{1}{\tan^2(x)} \operatorname{Sec}^2(x) \cdot \tan(x) =$$

$$= \frac{\operatorname{Sec}^{2}(x)}{\operatorname{tran}(x)}$$

## Alternative approach

$$\int \frac{\operatorname{Sec}^{2}(x)}{\operatorname{tom}(x)} dx = \int \frac{\operatorname{Sec}^{2}(x)}{u} \frac{du}{\operatorname{Sec}^{2}(x)} = \int \frac{1}{u} du =$$

$$u = tan(x)$$
 $du = Sec^2(x) dx$ 

## Verification:

$$\left(\ln\left|\tan(x)\right|\right) = \frac{1}{\tan(x)} \cdot \operatorname{Sec}^{2}(x)$$

4. Compute 
$$\int \frac{1}{x \ln(x)} dx$$

5. Compute 
$$\int \frac{\sin(4/x)}{x^2} dx$$

6. Compute 
$$\int \frac{e^x}{e^x - 3} dx$$

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

8. Compute 
$$\int \sqrt{x}(x^4+x) dx$$

9. Compute 
$$\int \cos(x)\sin(\sin(x)) dx$$

10. Compute  $\frac{d}{dx} [x \ln(x) - x]$ . Then compute  $\int s^2 \ln(s^3) \ ds$ 

11. Compute  $\int x\sqrt{x-1}\ dx$  (Hint: Let u=x-1. What is x in terms of u?)

12. Compute  $\int_1^3 \frac{(\ln(x))^3}{x} dx$