Math16600 Section 23715 Quiz 3
Fall 2023, September 12

Name: [1 pt]

Problem 1: Find the derivative of the function

$$f(x) = e^{\cosh 3x}$$

[5 pts]

Let $u = \cosh 3x \Rightarrow \frac{du}{dx} = \sinh(3x) \times \frac{d}{dx}(3x)$

$= 3\sinh(3x)$

$\Rightarrow f'(x) = \frac{d}{dx}(e^u) = \frac{d}{du}(e^u)\frac{du}{dx} = e^u(3\sinh 3x)$

$\Rightarrow f'(x) = 3\sinh(3x)\, e^{\cosh(3x)}$

Problem 2: Evaluate the integral:

$$\int_0^{\pi/2} \frac{\sin x}{1+\cos^2 x}\, dx$$

[5 pts]

$I = \int_0^{\pi/2} \frac{\sin x\, dx}{1+\cos^2 x}$

Let $u = \cos x$

$\Rightarrow du = -\sin x\, dx$

$\Rightarrow I = \int_{\cos 0}^{\cos \pi/2} \frac{-du}{1+u^2} = \int_1^0 -\frac{1}{1+u^2}\, du$

$= \int_0^1 \frac{1}{1+u^2}\, du$

$= \tan^{-1}(u)\Big|_0^1 = \tan^{-1}1 - \tan^{-1}0$

$= \frac{\pi}{4} - 0 = \frac{\pi}{4}$