Math 121　　　　　　　　Self-Assessment Quiz #2　　　　　　　　September 16, 2022

• Please see the course webpage for the answer key.

1. Compute $\displaystyle\int_{3}^{3\sqrt{3}} \frac{1}{\sqrt{36-x^2}} + \frac{1}{9+x^2}\ dx.$

2. Compute $\displaystyle\int \frac{4}{(1+x^2)(1+(\arctan x)^2)}\ dx.$

3. Compute $\displaystyle\int_{0}^{\ln\sqrt{2}} \frac{e^x}{\sqrt{4-e^{2x}}}\ dx.$

4. Compute $\displaystyle\int_{0}^{\ln 3} \sinh(2x)\ dx.$

5. (a) Use implicit differentiation to **PROVE** that $\dfrac{d}{dx}\arctan x = \dfrac{1}{1+x^2}$

(b) From part (a) we now know that $\dfrac{1}{1+x^2}\ dx = \arctan x + C$. Use this fact **and integration** to **PROVE** that $\displaystyle\int \frac{1}{3+x^2}\ dx = \frac{1}{\sqrt{3}}\arctan\left(\frac{x}{\sqrt{3}}\right) + C$

6. Use implicit differentiation to **PROVE** that $\dfrac{d}{dx}\sin^{-1}(5x) = \dfrac{5}{\sqrt{1-25x^2}}$