

- Please see the course webpage for the answer key.

1. Compute  $\int_3^{3\sqrt{3}} \frac{1}{\sqrt{36-x^2}} + \frac{1}{9+x^2} dx$ .

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

3. Compute  $\int_0^{\ln \sqrt{2}} \frac{e^x}{\sqrt{4-e^{2x}}} dx$ .

4. Compute  $\int_0^{\ln 3} \sinh(2x) dx$ .

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

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

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