

Written HW2 – MATH 2502 Spring 2021

**Due by 24 August for timely completion credit**

In class, we derived the formula  $\frac{d}{dx} \arcsin(x) = \frac{1}{\sqrt{1-x^2}}$  using basic trigonometry. In this homework, you will carry out the derivation of  $\frac{d}{dx} \arctan(x) = \frac{1}{1+x^2}$ .

- (1) Define  $u = \arctan(x)$  and solve for  $x$ .
- (2) Take the derivative with respect to  $x$  of both sides of the equation you obtained in (1) (*note: the chain rule will be required! pay attention to the variables*). Solve this equation for  $\frac{du}{dx}$ .
- (3) Draw a **right** triangle corresponding to the equation you found in (1) and label its sides appropriately (*note: "u" should be an angle here*).
- (4) Use the basic definitions of trigonometric functions to determine the value of the trigonometric function appearing in your answer to (2), in terms of the variable  $x$ .
- (5) Substitute the value found in (4) into the equation found in (2) to obtain  $\frac{d}{dx} \arctan(x)$  in terms of  $x$ .