

## Workshop 9 – Mean Value Theorem, Graph Sketching

1. Suppose  $f(x) = \arctan x + \arctan\left(\frac{1}{x}\right)$ .
  - (a) Compute  $f'(x)$  carefully and *simplify* it as much as you can.
  - (b) What does the Mean Value Theorem state about a function whose derivative is what you got in a)? (See the textbook or your notes if you don't remember!)
  - (c) Now graph  $f$  on your graphing calculator in the window  $-4 \leq x \leq 4$  and  $-2 \leq y \leq 2$ . Compare what the picture shows with the answer to (b) and explain the difference.
2.
  - (a) Suppose  $P(x)$  is any polynomial of degree four which has four distinct real roots. Can  $P'(x)$  have fewer than three real roots? Why or why not? How many real roots does  $P''(x)$  have?
  - (b) Give an example of a polynomial of degree four which has only three distinct real roots. How many real roots does its derivative have?
3. Follow the graph sketching guidelines on page 317 of the textbook to sketch the graph of the function

$$f(x) = e^{\frac{-1}{x^2-1}}$$