Math 120 Midterm 2 Practice

This midterm is 50 minutes, closed book. Solve each problem using the paper provided, and put your full name and student ID at the top of each sheet of paper.

No clarification will be given for any problems; if you believe a problem is ambiguous, interpret it as best you can and write down any assumptions you feel are necessary.

If you need more paper, there is are blank sheets at the front of the class. Be sure to put your name and student # on each sheet of paper.

Name: ______________________

Student #: __________________

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<th>Problem</th>
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1. Let \( f(x) = \arctan(x) \). Compute or recall \( f'(x) \), and use this to compute \( f''(x) \) and \( f'''(x) \). Use Taylor’s theorem with remainder to expand \( \arctan(x) \) around the point \( c = 0 \) as a degree two polynomial plus an error term (i.e. when applying Taylor’s theorem, \( n = 3 \)).
(scratch space for problem 1)
2. Let \( P = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_0 \) and \( Q = b_m x^m + b_{m-1} x^{m-1} + \ldots + b_0 \) be polynomials. Suppose that \( a_n > 0 \) and \( n > m \). Prove that \( \lim_{x \to \infty} e^{P(x)} e^{Q(x)} = \infty \). Be sure to carefully state any rules or theorems that you use about limits, exponential functions, etc.
Name: _______________________
Student #: ___________________ 

( scratch space for problem 2 )


3. Prove that the function \( f(x) = e^{x^3} \) has an inverse.
Name: ____________________________
Student #: _______________________

( scratch space for problem 3 )