Practice Final 1B

1. Evaluate the integral
   \[ \int \cos^2(\tan^{-1}(x))dx. \]

2. Determine whether the sequence is convergent or not, if it is convergent, find the limit
   \[ a_n = \frac{\tan^{-1}(n) + n}{\sqrt{1 + n^3}}. \]

3. Solve the differential equation
   \[ y'' - y = x + e^{-x}. \]

4. Find power series solution to the following initial value problem:
   \[ y'' - xy' - 2y = 0, \]
   \[ y(0) = 0, \quad y'(0) = 1. \]