Midterm 1

Time: 50min

1. Differentiate:

$$\textbf{a)}\ y = \tan(\ln e^{2x}) \qquad\qquad \textbf{b)}\ y = x^{\sin x}$$

2. Derive formulas for:

$$\textbf{a)}\ D_x(a^x) \qquad\qquad \textbf{b)}\ D_x(\cos^{-1}(x))$$

3. Find

$$\textbf{a)}\ \int \frac{x}{x^2 + 1}\, dx \qquad\qquad \textbf{b)}\ \int \frac{1}{x^2 + 4x + 8}\, dx$$

4. Prove

$$\textbf{a)}\ e^{-x} = \cosh x - \sinh x \qquad \textbf{b)}\ \tan(\sin^{-1} x) = \frac{x}{\sqrt{1 - x^2}}$$

5. A bacterial population grows at a rate proportional to its size. Initially it is 1000 and after 3 days it reaches 8000. What is the population after 5 days?

LATEX . . . . $\mathcal{MG}$