1. Use logarithmic differentiation to find the derivative of $y = x^{\cos x}$

2. Strontium-90 has half life of 28 days. A sample has a mass of 50 mg initially. Find a formula for the mass remaining after t days.

3. Prove that $\cos(\sin^{-1} x) = \sqrt{1 - x^2}$.

4. Find the derivative of the following functions:

    (i). $y = \tan^{-1}(x^2)$

    (ii). $y = \sin^{-1}(\cos x)$

5. Compute the following limits:

    (i). $\displaystyle\lim_{x \to 0} \frac{e^x - 1 - x}{x^2}$

    (ii). $\displaystyle\lim_{x \to \infty} \frac{2^x}{x}$

    (iii). $\displaystyle\lim_{x \to 0^+} (\sin x)(\ln x)$

    (iv). $\displaystyle\lim_{x \to 0^+} (\tan 2x)^x$

    (v). $\displaystyle\lim_{x \to \infty} \left(1 + \frac{a}{x}\right)^{bx}$