1. (8 points) Prove that \( \frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}. \)

2. (12 points) Use logarithmic differentiation to find the derivative of \( y = (\sin x)^{\ln x}. \)

3. (16 points) Find the limit.
   a) \( \lim_{x \to 0} \frac{\sec x - 1}{x^2} \)
b) \( \lim_{x \to 0^+} x^2 \ln x \)

4. (44 points) Find the indefinite integral, showing all work:

a) \( \int \sin^3 x \cos^8 x \, dx \)

b) \( \int x^{10} \ln x \, dx \)
c) \[ \int \frac{x}{(\sqrt{1-x^2})^5} \, dx \]

d) \[ \int \frac{7x - 19}{x^2 - 8x + 7} \, dx \]
5. (20 points) Find the definite integral, showing all work:

a) \[ \int_{0}^{1} \frac{x^2}{1 + x^6} \, dx \] (Hint: put \( u = x^3 \).)

b) \[ \int_{0}^{\pi/3} x \cos x \, dx \]