

Answer all of the following questions. Each part counts 5 points.

Calculators and mobile phones are not allowed

1. Find the derivative of

$$y = \log_3 \left[\log_5 \left(\sec^{-1} x \right) \right]$$

at $x = \frac{\pi}{3}$.

2. Evaluate the following integrals:

(a) $\int \sinh(\log x) dx$

(b) $\int x \sec^{-1} x^2 dx$

(c) $\int \frac{1 - \tan x}{1 + \tan x} dx$

(d) $\int \frac{\sin^3 x}{3 + \cos^2 x} dx$

(e) $\int x \sqrt{x - x^2} dx$

3. Evaluate the following limits:

(a) $\lim_{x \rightarrow 0} \frac{\sinh x - \sin x}{\sin^3 x}$

(b) $\lim_{x \rightarrow 0^+} \tan^{-1} x \cot x$

Good Luck