

MATH111-002 200530 Midterm 2

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Please do each of the following questions. The entire exam is worth 45 marks. You should be able to earn about 1 mark per minute and have 5 minutes left over at the end to check your work. A non-programmable calculator is permitted.

1. For each of the following equations, find a value of x (to four decimal places) which satisfies the equation.

(a) (2 marks) $\log_2(x+1) = 4$

(b) (4 marks) $\csc(\arccos x) = 1.25$

2. Calculate the derivatives of the following functions.

(a) (2 marks) $f(\theta) = 10^{\tan \theta}$

(b) (4 marks) $g(x) = \tan^{-1}\left(\frac{x}{a}\right) + \ln \sqrt{\frac{x+a}{x-a}}$

3. (5 marks) Use logarithmic differentiation to find the derivative of $y = \sqrt[4]{\frac{x^2+1}{x^2-1}}$.

4. Evaluate the following integrals.

(a) (5 marks) $\int_2^4 \frac{1+x-x^2}{x^2} dx$

(b) (5 marks) $\int 2^{\tan \theta} \sec^2 \theta d\theta$

5. Find the limits

(a) (5 marks) $\lim_{x \rightarrow 0} \frac{e^{4x} - 1 - 4x}{x^2}$

(b) (5 marks) $\lim_{x \rightarrow 0^+} (\cos x)^{1/x^2}$

6. (4 marks) Evaluate $\int \frac{dx}{\sqrt{x}(1+x)}$.

7. (4 marks) Find $\frac{d}{dx} \int_{\ln x}^{2x} e^{-t^2} dt$.