
M1M1: Progress Test 2: November 18th 2002

Write your name and tutorial group number on your answer book.

No calculators. No books/lecture notes.

50 minutes. Attempt all four questions.

1. Calculate the derivatives of the following four functions of x :

$$\frac{x^2 + 1}{x^2 - 1}; \quad \frac{1}{x^x}; \quad \sinh^{-1}(x); \quad (\sinh x)^{-1}.$$

- 2.

- (a) Sketch the graph of the function

$$f(x) = 1 + \frac{x^2 + 1}{x - 2}$$

clearly marking any asymptotes and stationary points on your sketch.

- (b) Sketch the curve given in polar coordinates (r, θ) by

$$r = \frac{1}{\sqrt{\cos^4 \theta - \sin^4 \theta}}$$

marking any asymptotes clearly on your sketch.

3. Find the first **three** non-zero terms in the Taylor series about $x = 0$ of the function $f(x) = \log(1 + \sin x)$.

4. Compute the value of

$$\frac{d^n}{dx^n} \left(\frac{1}{(1-x)(2-x)} \right)$$

at $x = 0$ where $n \geq 1$ is any positive integer.

THE END