MATH2132 Test1 May 22, 2013 60 minutes

Student Name - Student Number -

Values

**6** **1.** Find the limit for the following sequence of functions on the interval $0 \le x \le 5$, if it exists. Show your reasoning and all calculations.

$$\left\{\frac{n^3x^3 + n^2x^2 + 4}{2n^3x^2 + nx + 1}\right\}$$

**12** **2.** Determine whether the following series converge or diverge. If a series converges, find its sum. Justify your conclusions.

(a) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n 3^n}{2^{2n+1}}$ (b) $\displaystyle\sum_{n=1}^{\infty} \left(1 + \frac{1}{an}\right)^4$ where $0 < a < 5$ is a constant

**10** **3.** Find the open interval of convergence for the power series

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}[1 \cdot 4 \cdot 7 \cdots (3n+1)]}{2^n}(x+1)^{2n+1}.$$

**12** **4.** (a) For the function $f(x) = \dfrac{1}{4+3x}$, calculate $f'(x)$, $f''(x)$, $f'''(x)$, and more derivatives if necessary, in order to find a formula for the $n^{\text{th}}$ derivative $f^{(n)}(x)$ of the function.

(b) Use the result in part (a) to find a formula for the Taylor remainder $R_n(1, x)$, simplified as much as possible.