

MATH31B: Week 3

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Questions

Question 1. For the following functions f , find a value K such that for the given n and interval, $|f^{(n)}(x)| \leq K$ for all x in that interval.

(a) $f(x) = x^4$, $n = 3$ on $[0, 1]$

(b) $f(x) = \frac{1}{x}$, $n = 4$ on $[1, 2]$

(c) $f(x) = \cos(x)$ for all n and all $x \in \mathbb{R}$.

Question 2. Use the error bound for the Taylor polynomial to find error bounds for the following:

(a) $|f(0.1) - T_7(0.1)|$ where $f(x) = e^x$ and T_7 is centred at $a = 0$.

(b) $|f(4.3) - T_2(4.3)|$ where $f(x) = x^{-1/2}$ and T_2 is centred at $a = 4$.

Question 3. Use the error bound for the Taylor polynomial to find a value for n such that $|\cos(0.1) - T_n(0.1)| \leq 10^{-7}$ holds. Here T_n is centred at $a = 0$.

Question 4. For the following, use partial fraction decomposition before integrating.

(a) $\int \frac{dx}{x(2x+1)}$

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

(c) $\int \frac{8}{x(x+2)^3} dx$

(d) $\int \frac{x^2}{(x+1)(x^2+1)} dx$

Homework

9.4.25, 9.4.32, 9.4.37, 8.5.7, 8.5.15, 8.5.27