

2018 AP[®] CALCULUS BC FREE-RESPONSE QUESTIONS

6. The Maclaurin series for $\ln(1+x)$ is given by

$$x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots + (-1)^{n+1} \frac{x^n}{n} + \cdots.$$

On its interval of convergence, this series converges to $\ln(1+x)$. Let f be the function defined by

$$f(x) = x \ln\left(1 + \frac{x}{3}\right).$$

- (a) Write the first four nonzero terms and the general term of the Maclaurin series for f .
- (b) Determine the interval of convergence of the Maclaurin series for f . Show the work that leads to your answer.
- (c) Let $P_4(x)$ be the fourth-degree Taylor polynomial for f about $x = 0$. Use the alternating series error bound to find an upper bound for $|P_4(2) - f(2)|$.
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STOP
END OF EXAM