1)

The Maclaurin Series about $x=0$ is given by

$$f(x) = \sum_{n=0}^{\infty} \frac{(3x)^{n+1}}{n+1}$$

A) Find radius and interval of convergence using Ratio Test for Absolute Conv.

B) Check both endpts and adjust answer to part A

C. Find 1st 4 nonzero terms of series $f(x)$

D) Find 1st 4 terms of $f'(x)$

E) Using the 4-term series in part D, find $f'(-\frac{1}{3})$

2)

A) Using 4 derivatives, write the 1st 5 terms of the Maclaurin Series about $x=0$ for $f(x) = \frac{1}{1-x}$

B) Find the General Term of derivative, $f^n(x)$

C) Using general term found in part B, find for what values of x the series converges (Use Ratio Test for Abs. Conv)

(3)

The function f has derivatives of all orders for all real numbers x. $f(2) = -3$, $f'(2) = 5$, $f''(2) = 3$, $f'''(2) = -8$

A) Write a third-degree Taylor polynomial for f about $x = 2$

B) Use answer from Part A to approximate $f(1.5)$

C) The 4th derivative of f satisfies the inequality $|f^4(x)| \leq 3$ for all x in the closed interval $[1.5, 2]$. Use the Lagrange error bound on the approximation to $f(1.5)$ found in Part B to explain why $f(1.5) \neq -5$

D) Write a 4th degree Taylor polynomial $P(x)$ for $g(x) = f(x^2 + 2)$ about $x = 0$.
Use P to explain why g must have a relative minimum at $x = 0$.

(4)

A) Write Taylor Series about $x=0$ for $f(x)=\ln(1+x)$ including general term.
B) For what values of x does series converge
C) Estimate the error in evaluating $\ln\left(\frac{3}{2}\right)$ by using 1st 5 NON zero terms.

(5)

The Taylor Series, about $x=0$, for the function f is given by $f(x) = \sum_{n=0}^{\infty} \frac{(2x)^{n+1}}{n+1}$

A) Find the interval of convergence for f. Justify.

B) Find the 1st 4 Terms and general term for $f'(x)$

C) Use the series found in part B to find the value of $f'(-\frac{1}{3})$

(6) Actual AP Problem - Part C is Lagrange Error

A) Write Taylor Series about $x=0$ for 4 non-zero terms for $f(x) = \ln(1+x)$, including general term

B) For what values of x does the series converge

C) Estimate the Error in evaluating $\ln\left(\frac{3}{2}\right)$ by using 1st 5 non-zero terms