Taylor Series - Assignment 14

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For each function, only consider its valid ranges as indicated in the notes when you are computing the Taylor Series expansion.

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

$f'(x) = (-1)(-1)(1-x)^-2 = 1$ $f''(x) = (-1^2)(-1)(-2)(1-x)^-3 = 2$ $f'''(x) = (-1^3)(-1)(-2)(-3)(1-x)^-4 = 6$ $f^n(x) = (n!)(1-x)^-n$

Talor Series expansion $\frac{1}{(1-x)}$ $f(x) = \sum_{n \to 0}^{\infty} \frac{f^n(a)}{n!}(x-a)^n$ $f(x) = 1 + x + x^2 + x^3 + x^4 + ...$

2.) $f(x) = e^x$

$f(x) = \sum_{n \to 0}^{\infty} \frac{f^n(a)}{n!}(x-a)^n$ $f(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + ...$

3) $f(x) = ln(1+x)$

$f'(x) = \frac{1}{(1+x)} = 1$ $f''(x) = (-1)(1+x)^-2 = -1$ $f'''(x) = (-1)(-2)(1+x)^-3 = 2$

Talor Series $f(x) = \sum_{n \to 0}^{\infty} \frac{f^n(a)}{n!}(x-a)^n$ $f(x) = \sum_{n \to 0}^{\infty} \frac{(-1)^n}{n+1} x(n+1)$ $f(x) = x - \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + ...$

References http://mathworld.wolfram.com/TaylorSeries.html