KSooklall_Homework14

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Taylor Series

$$f(x) \quad = \sum_{n=0}^{\infty} \frac{f^n(c)}{n!}(x-c)^n$$

This week, we'll work out some Taylor Series expansions of popular functions.

Table 1: Table of Derivatives

x	f(x)	fˆ1(x)	fˆ2(x)	fˆ3(x)	fˆ4(x)
p1	1/(1-x)	1/(1-x)ˆ2	2/(1-x)ˆ3	6/(1-x)ˆ4	24/(1-x)ˆ5
p2	eˆx	eˆx	eˆx	eˆx	eˆx
p3	ln(1+x)	1/(1+x)	-1/(1+x)ˆ2	2/(1+x)ˆ3	-6/(1+x)ˆ4

Table 2: Values at c=0

c	f(0)	fˆ1(0)	fˆ2(0)	fˆ3(0)	fˆ4(0)
p1.n.c.	1	1	2	6	24
p2.n.c.	1	1	1	1	1
p3.n.c.	0	1	-1	2	-6

Exercise 1

$$\frac{1}{1-x} = 1 + x + 2 * x^2/2! + 6 * x^3/3! + 24 * x^4/4! + ... = 1 + x + x^2! + x^3 + x^4 + ... = \sum_{n=0}^{\infty} x^n$$

Exercise 2

$$e^x = 1 + x + x^2/2! + x^2/2! + x^2/2! + x^2/2! + ... = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

Exercise 3

$$ln(1+x) = x - x^2/2! + 2 * x^3/3! - 6 * x^4/4!... = x - x^2/2 + x^3/3 - x^4/4... = \sum_{n=0}^{\infty} (-1)^{n-1} \frac{x^n}{n}$$