Taylor Series

Practice problems

Expand all approximations to the first 5 nonzero terms.

1. What is the Taylor series approximation for any given polynomial function?

2. Find out the following Taylor approximations.
   i) $\sin x$ at $x = \pi$
   ii) e^x at $x = 3$

3. Write down the Taylor approximations of the following functions at x=0.
   i) $\cos(2x)$
   ii) e^{-x}
   iii) $\sin(x^2)$
   iv) xe^x

4. Write down the Taylor approximations of the following functions at x=0.
   i) $\tan x$
   ii) $\sec x$
   iii) $\arcsin x$

5. Compute the analytic functions of which the following are the Taylor series at x=0.
   i) $1 + x + x^2 + x^3 + \ldots\ldots + x^n$
   ii) $1 - x + x^2 - x^3 + \ldots\ldots.. + (-1)^n x^n$

6. Integrate the given series in 5. i) and 5. ii). What do you expect to find?

Bonus:

7. Write down the Taylor approximations of the following functions at x=0.
   i) $\ln(\sin x)$
   ii) $\sin(\cos x)$

8. Write down the Taylor approximations of the following functions at x=0.
   i) $\dfrac{e^x}{\cos x}$

   ii) $\dfrac{\sin x}{e^x}$