Indian Institute of Technology Delhi - Abu Dhabi

AMTL100: CALCULUS

Tutorial Sheet 7

(1) Find the radius and interval of convergence of the following power series.
   (i) $\sum_{n=1}^{\infty} \frac{(3x-1)^n}{n}$
   (ii) $\sum_{n=1}^{\infty} (-1)^n (x+1)^n$
   (iii) $\sum_{n=1}^{\infty} (2x)^n$
   (iv) $\sum_{n=1}^{\infty} \frac{nx^n}{n+2}$
   (v) $\sum_{n=1}^{\infty} \frac{x^n}{n \ln n}$
   (vi) $\sum_{n=1}^{\infty} \frac{nx^n}{n+2}$
   (vii) $\sum_{n=1}^{\infty} (1+\frac{1}{n})^n x^n$
   (viii) $\sum_{n=1}^{\infty} (\ln n) x^n$

(2) Find the Taylor series generated by f at $x = a$.
   (i) $f(x) = \frac{2+x}{1-x},\ a = 0$
   (ii) $f(x) = x \sin x,\ a = 0$
   (iii) $f(x) = \frac{1}{x^2},\ a = 1$
   (iv) $f(x) = e^x,\ a = 2$
   (v) $f(x) = x^4 + x^2 + 1,\ a = -2$

(3) Use Binomial series to find the first four nonzero terms of the Maclaurin series for the functions:
   (i) $(1+x)^{1/3}$
   (ii) $(1-x)^{-3}$
   (iii) $(1+x^2)^{-1/3}$
   (iv) $\frac{x}{\sqrt{1+x}}$

(4) Find a value for the constant b that will make the radius of convergence of the power series

$$\sum_{n=2}^{\infty} \frac{b^n x^n}{\ln n}$$

equal to 5.