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CALCULUS FOR ENGINEERS  
MATH 1110

## Tutorial No. 7

### Power Series

#### Problem No. (1)

Testing for Convergence Using the Ratio Test. For what values of  $x$  do the following power series converge?

$$(a) \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n} = x - \frac{x^2}{2} + \frac{x^3}{3} - \dots$$

$$(b) \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^{2n-1}}{2n-1} = x - \frac{x^3}{3} + \frac{x^5}{5} - \dots$$

$$(c) \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

$$(d) \sum_{n=0}^{\infty} n!x^n = 1 + x + 2!x^2 + 3!x^3 + \dots$$

#### Problem No. 2:

For the following problems

(a) Find the series' radius and interval of convergence. For what values of  $x$  does the series converge (b) absolutely, (c) conditionally?

$$1. \sum_{n=0}^{\infty} x^n$$

$$2. \sum_{n=0}^{\infty} (x+5)^n$$

$$3. \sum_{n=0}^{\infty} (-1)^n (4x+1)^n$$

$$4. \sum_{n=1}^{\infty} \frac{(3x-2)^n}{n}$$

$$5. \sum_{n=0}^{\infty} \frac{(x-2)^n}{10^n}$$

$$6. \sum_{n=0}^{\infty} (2x)^n$$

$$7. \sum_{n=0}^{\infty} \frac{nx^n}{n+2}$$

$$8. \sum_{n=1}^{\infty} \frac{(-1)^n (x+2)^n}{n}$$

$$9. \sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n}3^n}$$

$$10. \sum_{n=1}^{\infty} \frac{(x-1)^n}{\sqrt{n}}$$