

## Homework 7 2/27: MATH 112-1 Prof. Maxwell Auerbach

Show all work. No credit will be given for answers without sufficient work. No calculators are allowed. Collaboration with classmates is allowed, but all work submitted must be written out and explained by you.

### 3 Homework 7 Problems: Ratio Test and Root Test

3.1 Use the Ratio Test to determine whether the series is convergent or divergent.

1.1 a) (11.6.12)  $\sum_{k=1}^{\infty} k e^{-k}$

1.1 c) (11.6.14)  $\sum_{n=1}^{\infty} \frac{n!}{100^n}$

1.1 b) (11.6.18)  $\sum_{n=1}^{\infty} \frac{n!}{n}$

1.1 d) (11.6.13)  $\sum_{k=1}^{\infty} \frac{\cos(\pi k/3)}{k!}$

3.2 Use any test to determine whether the series is absolutely convergent, conditionally convergent, or divergent.

3.2 a) (11.6.28)  $\sum_{k=1}^{\infty} \left( \frac{-2}{n+1} \right)^{5n}$

3.2 b) (11.6.25)  $\sum_{n=1}^{\infty} \left( \frac{n^2+1}{2n^2+1} \right)^n$

### 4 Homework 7 Problems: Series

4.1 Test the series for convergence or divergence.

4.1 a) (11.7.6)  $\sum_{n=1}^{\infty} \frac{n^{2n}}{(1+3)^{3n}}$

4.1 c) (11.7.13)  $\sum_{n=1}^{\infty} \frac{3^n n^2}{n!}$

4.1 b) (11.7.26)  $\sum_{n=1}^{\infty} \frac{n^2+1}{5^n}$

4.1 d) (11.7.27)  $\sum_{k=1}^{\infty} \frac{k \ln(k)}{(k+1)^3}$

## Extra Problems 2/27: MATH 112-1 Prof. Maxwell Auerbach

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### 5 Extra Problems: Series

5.1 Test the series for convergence or divergence.

5.1 a) (11.7.1)  $\sum_{n=1}^{\infty} \frac{n^2 - 1}{(n^3 + 1)}$

5.1 f) (original)  $\sum_{k=1}^{\infty} \frac{\cos(2\pi k)}{k}$

5.1 b) (11.7.8)  $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}n^4}{4^n}$

5.1 g) (original)  $\sum_{n=1}^{\infty} \frac{\sin(n)(n+8)}{(n+26)(n+1)(n-17)}$

5.1 c) (original)  $\sum_{k=1}^{\infty} \frac{k^{3k}}{(k^2 - 2)^{2k}}$

5.1 h) (11.7.32)  $\sum_{n=1}^{\infty} \frac{(n!)^n}{n^{4n}}$

5.1 d) (11.7.20)  $\sum_{n=1}^{\infty} \frac{\sqrt[3]{k} - 1}{k(\sqrt{k} + 1)}$

5.1 i) (11.7.15)  $\sum_{n=1}^{\infty} \frac{2^{k-1}3^{k+1}}{k^k}$

5.1 e) (original)  $1 + \frac{-2}{3} + \frac{4}{9} + \frac{-8}{27} + \cdots$

5.1 j) (original)  $1 + \frac{3}{2} + \frac{9}{6} + \frac{27}{24} + \cdots$

5.2 (11.6.44) For which positive integers  $k$  is the following series convergent?

$$\sum_{n=1}^{\infty} \frac{(n!)^2}{(kn)!}$$

5.3 (11.6.39) The terms of a series are defined recursively by the equations

$$a_1 = 2 \quad a_{n+1} = \frac{5n+1}{4n+3}a_n$$

Determine whether  $\sum a_n$  converges or diverges.