

Math 8  
Final Exam Practice

**Sequence and Series**

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1) Using integration by parts compute the following integrals:

a.  $\int x \ln x \, dx$

b.  $\int (x + 1)^2 e^{x+1} \, dx$

c.  $\int \arctan(2x + 3) \, dx$

2) Find the sum of the following series or show that it diverges:

a.  $\sum_{n=0}^{\infty} \left(\frac{2012}{2013}\right)^n$

c.  $\sum_{n=5}^{\infty} \frac{4^n}{6^{n+2}}$

b.  $\sum_{n=1}^{\infty} \left(\frac{5}{3}\right)^n$

d.  $\sum_{n=1}^{\infty} (e^{1-n} - e^{-n})$

3) Determine if the following series converge or diverge:

a.  $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

c.  $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{3n}}{n}$

e.  $\sum_{n=1}^{\infty} \frac{n^2}{2 + n^4}$

b.  $\sum_{n=1}^{\infty} \frac{1}{\sqrt[n]{n}}$

d.  $\sum_{n=1}^{\infty} \left(1 - \frac{1}{2n}\right)^{n^2}$

f.  $\sum_{n=2}^{\infty} \frac{n}{(n-1) \ln n}$

4) Determine the radius and interval of convergence of the series

$$\sum_{n=0}^{\infty} (-1)^{n+2} \frac{(x-2)^n}{n4^n}.$$

5) Find the Taylor series about  $a = 0$  of the function  $f(x) = \frac{x}{(1-x)^2}$ .

(Hint: Consider the geometric series.)