Homework 12 - Math 142 **Name:** ______________________

1. Use the integral test to determine whether $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$ converges or diverges.

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2. Show that each of the following series converges by finding a larger, simpler series that converges.

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

   (b) $\sum_{n=0}^{\infty} \frac{2^n - n^2}{3^n}$.

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3. Determine whether the infinite series $\sum_{n=0}^{\infty} \frac{1}{\ln(n+2)}$ converges or diverges by finding a good comparison. Explain how your comparison works.

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4. Explain clearly how you can tell that the following infinite series must diverge:

$$\frac{3}{5} + \frac{7}{6} + \frac{11}{7} + \frac{15}{8} + \frac{19}{9} + \dots.$$

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5. How many terms of the alternating series $1 - \frac{1}{4} + \frac{1}{9} - \frac{1}{16} + \frac{1}{25} - \ldots$ would you need in order to estimate the sum with an error of less than 0.01? Use a calculator or Desmos to find the sum of the series to that level of accuracy.

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6. Use Desmos to approximate the sum $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{36^n\,(2n)!}$ by computing the partial sum up to the $n = 4$ term. Include an estimate for how much error there is in this approximation.

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7. Identify each series below as alternating, geometric, or p-series. Note: more than one description might apply so circle or list all that are appropriate. Then determine whether the series converges or diverges.

(a)	$\sum_{n=0}^{\infty} \frac{(-1)^n}{3^n}$	Alternating Geometric p-Series	Converges Diverges
(b)	$\sum_{n=2}^{\infty} (-1)^n \left(\frac{n^3}{n+1}\right)$	Alternating Geometric p-Series	Converges Diverges
(c)	$1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} + \frac{1}{\sqrt{5}} + \ldots$	Alternating Geometric p-Series	Converges Diverges

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