Homework 10 - Math 142 **Name:** ____________________

Due by 5:00pm Friday, April 30. Send a PDF with your solutions to `blins@hsc.edu`.

1. Re-write each series below using Σ-notation.

   (a) $1 - \frac{1}{4} + \frac{1}{7} - \frac{1}{10} + \frac{1}{13} - \ldots.$

   (b) $\frac{1}{10} + \frac{4}{100} + \frac{9}{1000} + \frac{16}{10000} + \ldots.$

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2. Find a Maclaurin series for each function below by starting with the Maclaurin series formulas on the Formula Sheet.

   (a) $\cos(\sqrt{x})$.

   (b) $\dfrac{\sin x}{x}$.

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3. Aside from a constant, the probability density function for the normal distribution is $e^{-x^2/2}$ which is impossible to integrate directly. It is possible, however to integrate the Maclaurin series for $e^{-x^2/2}$. Write down the first 5 terms of the Maclaurin series for $e^{-x^2/2}$, then integrate to get a Maclaurin series for $\int e^{-x^2/2}\, dx$.

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4. Make a table of derivatives for the function $f(x) = \ln(\cos x)$, and use it to find the 2nd degree Maclaurin polynomial for $f(x)$.

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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. Find the radius and interval of convergence for the power series $\displaystyle\sum_{n=1}^{\infty} \frac{n^2(x-5)^n}{6^n}$.

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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.

	Series	Type	Convergence
(a)	$\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{3^n}$	Alternating Geometric p-Series	Converges Diverges
(b)	$\displaystyle\sum_{n=2}^{\infty} (-1)^n \left(\frac{n^3}{n+1}\right)$	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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