Homework 0 MHF 2191

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1. Make a 3x5 table with a title row

   Answer:

Column 1	Column 2	Column 3	Column 4	Column 5

2. Find the radius of convergence and interval of convergence of the series.

   $$\sum_{n=1}^{\infty} \frac{x^n}{n^2 5^n} \tag{1}$$

   Answer:

   $$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = \lim_{n\to\infty} \left| \frac{x^{n+1}}{(n+1)^2 5^{n+1}} * \frac{n^2 5^n}{x^n} \right| = \lim_{n\to\infty} \frac{1}{(1+1/n)^2} \frac{|x|}{5} = \frac{|x|}{5}$$

   By the ratio test, this series converges when $\frac{|x|}{5} < 1$, or $|x| < 5$. Hence the radius of convergence is 5.

   Checking the endpoints: When $x = -5$, the series is $\sum_{n=1}^{\infty} \frac{1}{n^2}$, which is a convergent p-series.

   When $x = 5$, the series becomes $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$, which converges by the alternating series test.

3. Find the area of the region that lies inside both circles $r = 2\sin(\theta)$ and $r = \sin(\theta) + \cos(\theta)$. Hint: consider two regions.

   Answer: The curves intersect where $2\sin(\theta) = \sin(\theta) + \cos(\theta) \implies \sin\theta = \cos\theta \implies \theta = \frac{\pi}{4}$, and also at the origin at which $\theta = \frac{3\pi}{4}$ on the second curve.

   $$A = \int_0^{\frac{\pi}{4}} \frac{1}{2}(2\sin\theta)^2 d\theta + \int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \frac{1}{2}(\sin\theta+\cos\theta)^2 d\theta = \int_0^{\frac{\pi}{4}} (1-\cos 2\theta) d\theta + \frac{1}{2}\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} (1+\sin 2\theta) d\theta =$$

$$[\theta - \frac{1}{2}\sin 2\theta]_0^{\frac{\pi}{4}} + [\frac{1}{2}\theta - \frac{1}{4}\cos 2\theta]_{\frac{\pi}{4}}^{\frac{3\pi}{4}} = \frac{1}{2}(\pi - 1)$$

4. Create a 4 x 9 matrix. Use bmatrix

   Answer:
$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

5. Create an itemized list with an itemized sublist.

   (a) (Submitted by Dewey) $x = 3$

   (b) (Submitted by Cheatem) $x = \frac{3}{4}$ or $x = \frac{3}{4}$

   (c) (Submitted by Andy Howe)

      i. a regular, inline fraction: $x = \frac{3}{\frac{a}{0}}$

      ii. A fraction centered on a new line with larger size:
$$x = \frac{3}{\frac{a}{0}}$$

      iii. A fraction, inline, but with larger size: $x = \frac{3}{\frac{a}{0}}$

6. I can type **bold text**, *italicized text*, the reals $\mathbb{R}$ using "backslash mathbb" or $\mathbb{R}$ using "backslash R" (since it is a "newcommand") and the integers $\mathbb{Z}$ or $\mathbb{Z}$.

   I can even type $x \in \mathbb{N}$ or $A \cap B \subseteq C$.

7. Take a picture of yourself and insert it here. Be sure to upload your picture file with your tex file.

   Answer: