7. [7 points] Determine if the following series converges or diverges using the **Limit Comparison Test**, and circle the corresponding word. **Fully justify** your answer including using **proper notation** and showing mechanics of any tests you use.

$$\sum_{n=1}^{\infty} \frac{\sqrt{2n^2 - 3n + 4}}{n^2 - n + 1}$$

Circle one: **Converges** **Diverges**

*Justification (using the **Limit Comparison Test**):*

Solution: We have

$$\lim_{n\to\infty} \left(\frac{\sqrt{2n^2 - 3n + 4}}{n^2 - n + 1} \right) \Big/ \left(\frac{1}{n} \right) = \lim_{n\to\infty} \frac{n\sqrt{2n^2 - 3n + 4}}{n^2 - n + 1} = \sqrt{2}.$$

The series $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges by the p-test ($p = 1$), so $\sum_{n=1}^{\infty} \frac{\sqrt{2n^2 - 3n + 4}}{n^2 - n + 1}$ diverges by LCT.

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