

PRINT Your Name: _____

Quiz 10 — October 31, 2012 – Section 10 – 11:15 – 12:05

Remove everything from your desk except a pencil or pen.

Circle your answer. **Show your work.** Your work should be correct and coherent.

The quiz is worth 5 points.

Does the series $\sum_{n=1}^{\infty} \frac{\cos^2 n}{n^2+1}$ converge? **Justify your answer. Write in complete sentences.**

Answer: Yes, the series $\sum_{n=1}^{\infty} \frac{\cos^2 n}{n^2+1}$ does converge. We compare $\sum_{n=1}^{\infty} \frac{\cos^2 n}{n^2+1}$ to $\sum_{n=1}^{\infty} \frac{1}{n^2}$. Both series are series of non-negative numbers. We know that $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is the p -series with $p = 2 > 1$; hence the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ converges. Furthermore, $\frac{\cos^2 n}{n^2+1} < \frac{1}{n^2}$ because $\cos^2 n \leq 1$ and $n^2 \leq n^2 + 1$ so

$$\frac{\cos^2 n}{n^2+1} \leq \frac{1}{n^2+1} < \frac{1}{n^2}.$$

Our conclusion follows from the comparison test.