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Calculus 1432
Quiz 12
April 11, 2014

**1 point each out of 10 --- you can make an 11!**
**For each of the below, determine whether the series converges or diverges. You do not have to state the test you used.**

1. $\sum 2\left(\frac{1}{5}\right)^n = 2\cdot\frac{1}{1-\frac{1}{5}} = \frac{5}{2}$

Converges

By Ratio Test, let $a_n = 2\left(\frac{1}{5}\right)^n$

Then $\frac{a_{n+1}}{a_n} = 2\cdot\left(\frac{1}{5}\right)^{n+1}\cdot\frac{1}{2}\cdot\frac{5^n}{1} = \frac{1}{5} < 1$

2. $\sum \frac{125}{k} \approx \frac{1}{k}$

Diverges

By Limit Comparison Test

3. $\sum_{k=1}^{\infty} 10k^{\frac{-5}{2}} = 10\frac{1}{k^{\frac{5}{2}}} \approx \frac{1}{k^{\frac{5}{2}}}$

Converges

By Limit Comparison Test

4. $\sum_{k=1}^{\infty}\left(\frac{3k^2+9k+6}{2k^3+5k^2}\right) \approx \frac{1}{k}$

Diverges

By Limit Comparison Test.

5. $\sum_{k=1}^{\infty}\left(\frac{3^{k+2}}{7^{k-1}}\right)$

Converges

By Ratio Test, let $a_k = \frac{3^{k+2}}{7^{k-1}}$

$\frac{a_{k+1}}{a_k} = \frac{3^{k+3}}{7^k}\cdot\frac{7^{k-1}}{3^{k+2}} = \frac{3}{7} < 1$

6. $\sum \frac{1}{(n+2)(n+7)} \approx \frac{1}{n^2}$

Converges

By Limit Comparison Test.

7. $\sum_{k=1}^{\infty}\left(\frac{1}{k+6}\right)^k$

Converges

By root test, let $a_k = \left(\frac{1}{k+6}\right)^k$

$\sqrt[k]{a_k} = \frac{1}{k+6} \to 0 < 1$.

8. $\sum_{k=1}^{\infty}\frac{k^2+2}{k^5} \approx \frac{1}{k^3}$

Converges

By Limit Comparison Test

9. $\sum \frac{k!}{k^5}$

Diverges

By Ratio Test

let $a_k = \frac{k!}{k^5}$

$\frac{a_{k+1}}{a_k} = \frac{(k+1)!}{(k+1)^5}\cdot\frac{k^5}{k!}$

$= (k+1)\cdot\left(\frac{k}{k+1}\right)^5 \to \infty > 1$

as $k \to \infty$

10. $\sum_{k=1}^{\infty}\frac{k}{6^k}$

Converges

By Ratio Test, let $a_k = \frac{k}{6^k}$

$\frac{a_{k+1}}{a_k} = \frac{k+1}{6^{k+1}}\cdot\frac{6^k}{k} = \frac{1}{6}\cdot\frac{k+1}{k} \to \frac{1}{6} < 1$

11. $\sum_{k=1}^{\infty}\frac{7}{(k+3)!}$

Converges

By Ratio Test

let $a_k = \frac{7}{(k+3)!}$

$\frac{a_{k+1}}{a_k} = \frac{7}{(k+4)!}\cdot\frac{(k+3)!}{7} = \frac{1}{k+4} \to 0 < 1$ as $k \to \infty$