1. (1 pt) Each of the following statements is an attempt to show that a given series is convergent or divergent not using the Comparison Test (NOT the Limit Comparison Test.) For each statement, enter C (for "correct") if the argument is valid, or enter I (for "incorrect") if any part of the argument is flawed. (Note: if the conclusion is true but the argument that led to it was wrong, you must enter I.)

___1. For all $n > 1$, $\frac{\sin^2(n)}{n^2} < \frac{1}{n^2}$, and the series $\sum \frac{1}{n^2}$ converges, so by the Comparison Test, the series $\sum \frac{\sin^2(n)}{n^2}$ converges.

___2. For all $n > 1$, $\frac{\arctan(n)}{n^3} < \frac{\pi}{2n^3}$, and the series $\frac{\pi}{2}\sum \frac{1}{n^3}$ converges, so by the Comparison Test, the series $\sum \frac{\arctan(n)}{n^3}$ converges.

___3. For all $n > 1$, $\frac{1}{n\ln(n)} < \frac{2}{n}$, and the series $2\sum \frac{1}{n}$ diverges, so by the Comparison Test, the series $\sum \frac{1}{n\ln(n)}$ diverges.

___4. For all $n > 2$, $\frac{1}{n^2-1} < \frac{1}{n^2}$, and the series $\sum \frac{1}{n^2}$ converges, so by the Comparison Test, the series $\sum \frac{1}{n^2-1}$ converges.

___5. For all $n > 2$, $\frac{\ln(n)}{n^2} > \frac{1}{n^2}$, and the series $\sum \frac{1}{n^2}$ converges, so by the Comparison Test, the series $\sum \frac{\ln(n)}{n^2}$ converges.

___6. For all $n > 2$, $\frac{\sqrt{n+1}}{n} > \frac{1}{n}$, and the series $\sum \frac{1}{n}$ diverges, so by the Comparison Test, the series $\sum \frac{\sqrt{n+1}}{n}$ diverges.

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2. (1 pt) For each sequence a_n find a number k such that $n^k a_n$ has a finite non-zero limit.
(This is of use, because by the limit comparison test the series $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} n^{-k}$ both converge or both diverge.)

A. $a_n = (6+3n)^{-5}$
k = ________

B. $a_n = \frac{5}{n^7+n}$
k = ________

C. $a_n = \frac{3n^2+5n+3}{4n^3+7n+3}$
k = ________

D. $a_n = \left(\frac{3n^2+5n+6}{4n^3+7n+3\sqrt{n}}\right)^7$
k = ________

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3. (1 pt) For each sequence a_n find a number r such that $\frac{a_n}{r^n}$ has a finite non-zero limit.
(This is of use, because by the limit comparison test the series $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} r^n$ both converge or both diverge.)

A. $a_n = (4+3^n)^{-4}$
r = ________

B. $a_n = \frac{4^{2n}}{4^n+n}$
r = ________

C. $a_n = \frac{6^n+n^4+6}{19^{10n}+4^n+3}$
r = ________

D. $a_n = \left(\frac{6n^2+4n+4^{0.9n}}{19^{n+10}+4n+3\sqrt{n}}\right)^{10}$
r = ________

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4. (1 pt) Determine whether following the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{6}{n^2+5n+3}$$

Input C for convergence and D for divergence: ___
Note: You have only one chance to enter your answer.

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5. (1 pt) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{4}{4+5^n}$$

Input C for convergence and D for divergence: ___
Note: You have only one chance to enter your answer.

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6. (1 pt) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{3}{n9^n}$$

Input C for convergence and D for divergence: ___
Note: You have only one chance to enter your answer.

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7. (1 pt) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{7+\cos n}{3^n}$$

Input C for convergence and D for divergence: ___
Note: You have only one chance to enter your answer.

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8. (1 pt) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{6^n}{7+7^n}$$

Input C for convergence and D for divergence: ___
Note: You have only one chance to enter your answer.