Present neatly ~~on separate paper~~. Justify for full credit. No Calculators.

Name ______________________ Score ______ A (15 minutes) **x3**

For questions 1 through 3, determine whether the series converges or diverges.

1)

$$\sum_{k=1}^{\infty} \frac{1}{2 + \sin k}$$

The series diverges by the divergence test. The limit of the series does not exist, as its values oscillate between 1/3 and 1.

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2)

$$\sum_{k=1}^{\infty} \frac{2^k k!}{(k+2)!}$$

Apply the Ratio Test to confirm that the series diverges. The limit of the ratio (in absolute value) in this case turns out to be 2, which is greater 1.

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3)

$$\sum_{n=1}^{\infty} (-1)^n \frac{n^3}{n^4 + 1}$$

Apply the Alternating Series. Confirm that the positive part of the sequence is a decreasing function. Also, confirm that the limit of the positive part is zero. Both conditions pass, therefore the series converges.

Present neatly ~~on separate paper~~. Justify for full credit. No Calculators.

Name ______________________ Score ______ F (15 minutes) **x3**

For questions 1 through 3, determine whether the series converges or diverges.

1)

$$\sum_{k=1}^{\infty} \frac{1}{2 + \sin k}$$

The series diverges by the divergence test. The limit of the series does not exist, as its values oscillate between 1/3 and 1.

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2)

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

Limit Comparison Test with the p-series SIGMA(3 n^(1.5)). The limit of the ratio is equal to 1, which is a positive constant. Since the reference series is a p-series with p>1, it converges. By the Limit Comparison Test, both series converge.

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3)

$$\sum_{n=1}^{\infty} \frac{\sin 2n}{1 + 2^n}$$

Test for Absolute Convergence by comparing with SIGMA(1/2^n). The geometric series is clearly greater than the given series. Since the geometric series converges (-1 < ½ < 1), then by the Comparison Test, the given series converges absolutely. Absolute convergence implies convergence.
Done
