Math 163 - Calculus - Exam 2 - Guide **Name:** ____________________
February 20, 2025
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1. In each of the following, determine convergence/divergence. Indicate which test(s) you are using.

(1.1) Indicate absolute convergence, conditional convergence or divergence

$$\sum_{k=0}^{\infty} \frac{(-1)^n}{2n}$$

(1.2) $\displaystyle\sum_{k=2}^{\infty} \frac{2k\sqrt[3]{k}}{3k^2+5k+1}$

(1.3) $\displaystyle\sum_{k=1}^{\infty} \cos\left(\frac{1}{k^2}\right)$

(1.4) $\displaystyle\sum_{k=1}^{\infty}\left[\frac{8}{5}-\frac{\sqrt[k]{5}}{2}\right]^k$

(1.5) $\displaystyle\sum_{k=2}^{\infty}\frac{7k}{k^3+17}$

(1.6) $\displaystyle\sum_{k=0}^{\infty}\frac{5^{3k}}{(2k)!}$

(1.7) $\displaystyle\sum_{k=1}^{\infty} \sin\left(\frac{1}{k}\right)$

2. Prove the following statement: If $\sum a_n$ converges, then $\lim_{n\to+\infty} a_n = 0$

3. Find the value of the convergent series below:

(3.1) $\displaystyle\sum_{k=1}^{+\infty} \frac{2^{k+1}}{3^{k-1}}$

(3.2) $\displaystyle\sum_{k=2}^{+\infty} \left[64^{1/k} - 64^{1/(k+2)}\right]$

4. Give three examples (each) of . . .

(4.1) a divergent alternating series

(4.2) a conditionally convergent alternating series.

(4.3) an absolutely convergent alternating series

(4.4) a decreasing *sequence* that converges to $\ln 7$.

(4.5) a strictly increasing *sequence* that converges to e.

Scratchwork