Daily Quiz

- Go to Socrative.com and complete the quiz.
- Room Name: HONG5824
- Use your full name.

8.4 “Correct to _ decimal places”

- Let’s say we want to write 1.74 correct to one decimal place.
- Is the rounded answer 1.7?
- How about 1.8?
- Which one is the better answer? Why?
- Estimating a number correct to one decimal place means I want to round the first decimal place.
- This is guaranteed if the distance between the actual number and the rounded number is less than 0.05. (Note that there is one 0 followed by a 5)

8.4 "Correct to x decimal places"

- If we want the rounded answer to be accurate within TWO decimal places, what number should we use to bound the difference between the estimate and the actual number?
- 0.005

- How about THREE decimal places?
- 0.0005

- FOUR decimal places?
- 0.00005

8.4 Alternating Series Estimation Theorem

Alternating Series Estimation Theorem.

If $\sum_{n=1}^{\infty}(-1)^{n-1}\ b_n = s$ is the sum of an alternating series that satisfies

$$\text{(i)} \lim_{k\to\infty} b_k = 0 \qquad \text{and} \qquad \text{(ii)}\ b_k \geq b_{k+1}$$

then $|R_n|$, the error for the n-th partial sum, is less than or equal to the $(n+1)$-th term, b_{n+1}.

$$|R_n| = |s - s_n| \leq b_{n+1}.$$

Note that $s_n = \sum_{k=1}^{n}(-1)^{k-1}b_k$. In other words, the error will be less than or equal to the next term.

8.4 Alternating Series Estimation Theorem

V EXAMPLE 4 Using the Alternating Series Estimation Theorem

Find the sum of the series $\sum_{n=0}^{\infty} \frac{(-1)^n}{n!}$ correct to three decimal places.

8.3 Remainder Estimate for the Integral Test.

Suppose $f(k) = a_k$, where $f(x)$ is a continuous, positive decreasing function for $x \geq n$ and $\sum_{n=1}^{\infty} a_n$ is convergent. If $R_n = s - s_n$ where s_n is the n-th partial sum, then

$$\int_{n+1}^{\infty} f(x)\, dx \leq R_n \leq \int_{n}^{\infty} f(x)\, dx.$$

Also,

$$s_n + \int_{n+1}^{\infty} f(x)\, dx \leq s \leq s_n + \int_{n}^{\infty} f(x)\, dx.$$

8.3 Remainder Estimate for the Integral Test

V EXAMPLE 6 Estimating the sum of a series

(a) Approximate the sum of the series $\Sigma\ 1/n^3$ by using the sum of the first 10 terms. Estimate the error involved in this approximation.

(b) How many terms are required to ensure that the sum is accurate to within 0.0005?

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