1 Circle True or False for the following statements.

a) If $\sum_{n=1}^{\infty} a_n$ converges then the sequence $\{a_n\}$ converges.

TRUE FALSE

b) If $\lim_{n\to\infty} a_n = 2$ then $\sum_{n=1}^{\infty} a_n$ diverges.

TRUE FALSE

c) The series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$ diverges.

TRUE FALSE

d) If $\sum_{n=1}^{\infty} (a_n + b_n)$ converges then both $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ must converge.

TRUE FALSE

e) If $a_n > b_n$ for all n and $\sum a_n$ converges then $\sum b_n$ must converge by the comparison test.

TRUE FALSE

Circle True or False for the following statements.

a) If $\sum_{n=1}^{\infty} a_n$ converges then the sequence $\{a_n\}$ converges.

$a_n \to 0$ necessarily

TRUE FALSE

b) If $\lim_{n\to\infty} a_n = 2$ then $\sum_{n=1}^{\infty} a_n$ diverges.

$a_n \not\to 0$ hence series diverges

TRUE FALSE

c) The series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$ diverges.

p-series, $p = \frac{1}{2} \leq 1$

TRUE FALSE

d) If $\sum_{n=1}^{\infty}(a_n + b_n)$ converges then both $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ must converge.

$a_n = +1$ $b_n = -1$

TRUE FALSE

e) If $a_n > b_n$ for all n and $\sum a_n$ converges then $\sum b_n$ must converge by the comparison test.

Σb_n could be any negative divergent series with $b_n < a_n$

Need $b_n \geq 0$ for comparison test.

TRUE FALSE

2 Circle True or False for the following statements.

a) If $\lim_{n\to\infty} a_n = 0$ then $\sum_{n=1}^{\infty} a_n$ converges.

TRUE FALSE

b) If a sequence $\{a_n\}$ converges then the series $\sum_{n=1}^{\infty} a_n$ must converge.

TRUE FALSE

c) If a series converges conditionally then it does not converge absolutely.

TRUE FALSE

d) The series $\sum_{n=1}^{\infty} \frac{n}{n+1}$ diverges.

TRUE FALSE

e) Suppose that $b_n > 0$, $\lim_{n\to\infty} b_n = 0$ but that $\{b_n\}$ is <u>not</u> a decreasing sequence. Then, the Alternating Series Test implies $\sum_{n=1}^{\infty}(-1)^n b_n$ diverges.

TRUE FALSE

Circle True or False for the following statements.

a) If $\lim_{n\to\infty} a_n = 0$ then $\sum_{n=1}^{\infty} a_n$ converges.

TRUE

FALSE

$\sum_{n\geq 1} \frac{1}{n}$ diverges!

b) If a sequence $\{a_n\}$ converges then the series $\sum_{n=1}^{\infty} a_n$ must converge.

$a_n = \frac{n}{n+1} \to 1 \neq 0$

TRUE

FALSE

$\sum_{n\geq 1} \frac{n}{n+1}$ diverges!

c) If a series converges conditionally then it does not converge absolutely.

TRUE

FALSE

Definition of conditional convergence

d) The series $\sum_{n=1}^{\infty} \frac{n}{n+1}$ diverges.

$a_n = \frac{n}{n+1} \not\to 0$

TRUE

FALSE

e) Suppose that $b_n > 0$, $\lim_{n\to\infty} b_n = 0$ but that $\{b_n\}$ is not a decreasing sequence. Then, the $\underbrace{\text{Alternating Series Test}}_{\text{needs } b_n \downarrow}$ implies $\sum_{n=1}^{\infty}(-1)^n b_n$ diverges.

Hard. Let

$b_n = \begin{cases} 1/n & n \text{ even} \\ 0 & n \text{ odd} \end{cases}$

then

TRUE

FALSE

$S = \frac{1}{2} + \frac{1}{4} + \cdots = \frac{1}{2}\sum_{n\geq 1} \frac{1}{n}$

diverges