

10. [12 points] Show that the following statements are false by giving a concrete example to contradict each of the statement. You can write a formula or draw a clear, well-labeled graph in place of the blanks. Accompany your example with a brief but complete explanation.

a. [4 points] If $\lim_{n \rightarrow \infty} a_n = 0$, then $\sum_{n=1}^{\infty} a_n$ converges.

Give your answer in the form:

“The statement is false when $a_n =$ _____ because...”

b. [4 points] For any continuous function $f(x)$ with $f(x) > 0$, the improper integral $\int_{-100}^{\infty} f(x) dx$ always diverges.

Give your answer in the form:

“The statement is false when $f(x) =$ _____ because...”

c. [4 points] If $P(x)$ is a cumulative distribution function, then $P(0) = 0$.

Give your answer in the form:

“The statement is false when $P(x) =$ _____ because...”

(Note: Your $P(x)$ needs to be a cumulative distribution function, but you do not need to show/prove that it is.)