11. [10 points] You work for a temp agency. Today you fill in for Russ Weterson, doing important work for the city. On Mr. Weterson's desk you find the following problems with a note: "Russ, the Mayor needs these problems done yesterday. -Brontel"

Suppose $f(x)$ and $g(x)$ are positive, continuous, decreasing functions such that

1. $\int_1^\infty f(x)\,dx$ converges, and
2. $0 \le g(x) \le 9$ for all real numbers x.

Determine whether the following expressions must converge, must diverge, or whether convergence cannot be determined. **No justification required.**

a. [2 points] $\displaystyle\int_1^\infty \frac{1}{f(x)}\,dx$

CONVERGES [DIVERGES] CANNOT BE DETERMINED

b. [2 points] $\displaystyle\sum_{n=1}^{\infty} f(n)$

[CONVERGES] DIVERGES CANNOT BE DETERMINED

c. [2 points] $\displaystyle\int_1^\infty f(x)g(x)\,dx$

[CONVERGES] DIVERGES CANNOT BE DETERMINED

d. [2 points] $\displaystyle\sum_{n=1}^{\infty} f(n)^{g(n)}$

CONVERGES DIVERGES [CANNOT BE DETERMINED]

e. [2 points] $\displaystyle\int_1^\infty g(x)\,dx$

CONVERGES DIVERGES [CANNOT BE DETERMINED]