10. [12 points] Suppose that $g(x)$ and $h(x)$ are positive continuous functions on the interval $(0, \infty)$ with the following properties:

- $\int_1^\infty g(x)\,dx$ converges.
- $\int_0^1 g(x)\,dx$ diverges.
- $e^{-x} \leq h(x) \leq \frac{1}{x}$ for all x in $(0, \infty)$.

For each of the following questions, circle the correct answer.

a. [2 points] Does the integral $\displaystyle\int_1^\infty h(x)^2\,dx$ converge?

[Converge] Diverge Cannot determine

b. [2 points] Does the integral $\displaystyle\int_0^1 h(x)\,dx$ converge?

Converge Diverge [Cannot determine]

c. [2 points] Does the integral $\displaystyle\int_1^\infty h(1/x)\,dx$ converge?

Converge [Diverge] Cannot determine

d. [2 points] Does the integral $\displaystyle\int_0^1 g(x)h(x)\,dx$ converge?

Converge [Diverge] Cannot determine

e. [2 points] Does the integral $\displaystyle\int_1^\infty g(x)h(x)\,dx$ converge?

[Converge] Diverge Cannot determine

f. [2 points] Does the integral $\displaystyle\int_1^\infty e^x g(e^x)\,dx$ converge?

[Converge] Diverge Cannot determine