3. [12 points] Let $g(x)$ and $h(x)$ be nonnegative functions defined for $x \geq 0$, let h be differentiable for $x \geq 0$ and suppose that

- $g(x) \leq 4$ when $x \geq 1$
- $\lim_{x\to\infty} h(x) = 0$
- $\lim_{x\to 0} \frac{h(x)}{x} = 0$
- $\int_0^\infty h(x)dx$ and $\int_0^\infty \frac{h(x)}{x^2}dx$ both converge
- $\int_0^\infty g(x)dx$ diverges

Indicate whether you think the following integrals converge, diverge, or whether there is not enough information to determine convergence. You do not need to show your work for this page.

a. [3 points] $\int_0^\infty g(x)h(x)dx$

CONVERGES DIVERGES **CANNOT TELL**

b. [3 points] $\int_1^\infty g(x)h(x)dx$

CONVERGES DIVERGES CANNOT TELL

c. [3 points] $\int_0^\infty \frac{g(x)+h(x)}{2}dx$

CONVERGES **DIVERGES** CANNOT TELL

d. [3 points] $\int_0^1 \frac{h(x)}{x}dx$

CONVERGES DIVERGES CANNOT TELL