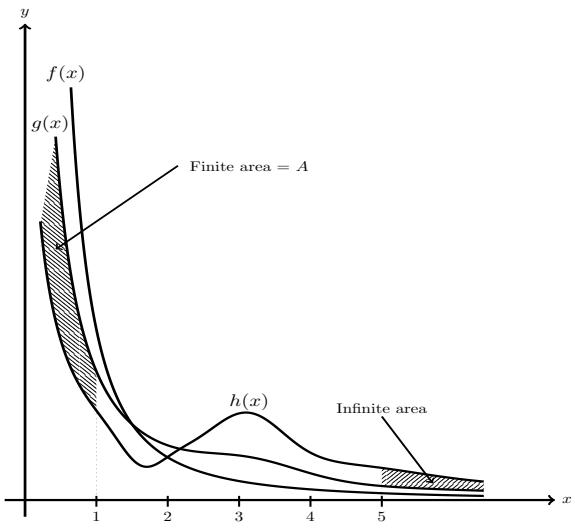
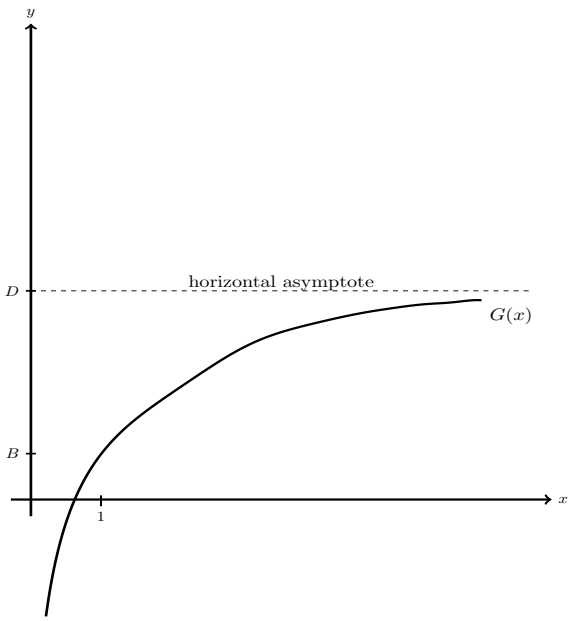
8. [15 points] Graphs of f, g and h are below. Each function is positive, is continuous on $(0, \infty)$, has a horizontal asymptote at $y = 0$ and has a vertical asymptote at $x = 0$. The area between $g(x)$ and $h(x)$ on the interval $(0, 1]$ is a finite number A, and the area between $g(x)$ and $h(x)$ on the interval $[5, \infty)$ is infinite. On the right is a graph of an antiderivative $G(x)$ of $g(x)$. It also has a vertical asymptote at $x = 0$.

Use the information in these graphs to determine whether the following three improper integrals **converge**, **diverge**, or whether there is **insufficient information to tell**. You may assume that f, g and h have no intersection points other than those shown in the graph. **Justify all your answers**.



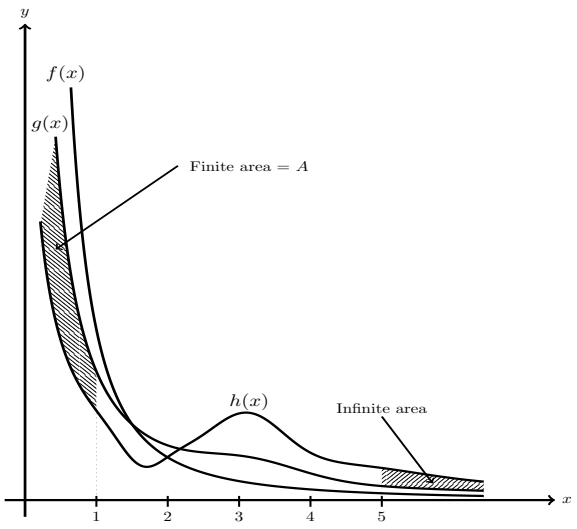


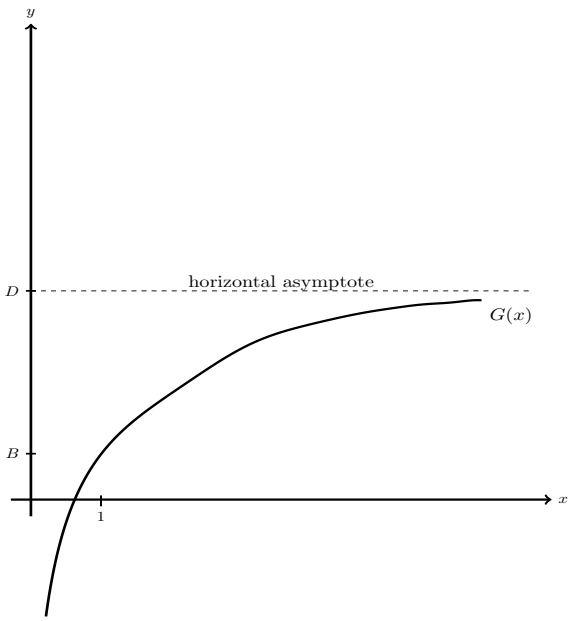
a. [3 points] $\displaystyle\int_1^\infty h(x)dx$

b. [4 points] $\displaystyle\int_0^1 g(x)dx$

(problem 8 continued)

These graphs are the same as those found on the previous page.





c. [3 points] $\displaystyle\int_0^1 h(x)dx$

d. [5 points] If $f(x) = 1/x^p$, what are all the possible values of p? **Justify your answer**.