1. [11 points] For each of parts **a - d** below:

- Find the *exact* value, if possible. Recall that $x = \sqrt{2}$ is a solution in exact form to the equation $x^2 = 2$, but $x = 1.41421356237$ is not.
- If the given limit or integral either does not exist or diverges, write "DOES NOT EXIST".
- If there is not enough information, write "NOT ENOUGH INFO".
- You do not have to show work, but work shown might be considered for partial credit.

a. [2 points] Suppose $f(x)$ is a continuous, positive, and decreasing function such that $\int_2^\infty f(x)\,dx$ converges. Find $\lim_{x\to\infty} f(x)$.

Answer: $\lim_{x\to\infty} f(x) =$ 0

b. [3 points] Find $\int_0^\infty \frac{1}{x^{0.7}}\,dx$. $= \lim_{b\to\infty} \int_0^b x^{-.7}\,dx = \lim_{b\to\infty} \frac{1}{.3}x^{.3}\Big|_0^b = \lim_{b\to\infty} \frac{b^{.3}-0^{.3}}{.3}$

$= \infty$

Answer: $\int_0^\infty \frac{1}{x^{0.7}}\,dx =$ DOES NOT EXIST

c. [3 points] Suppose μ is a real number. Find $\int_{-\infty}^\infty e^{-(x-\mu)^2/0.0002}\,dx$.

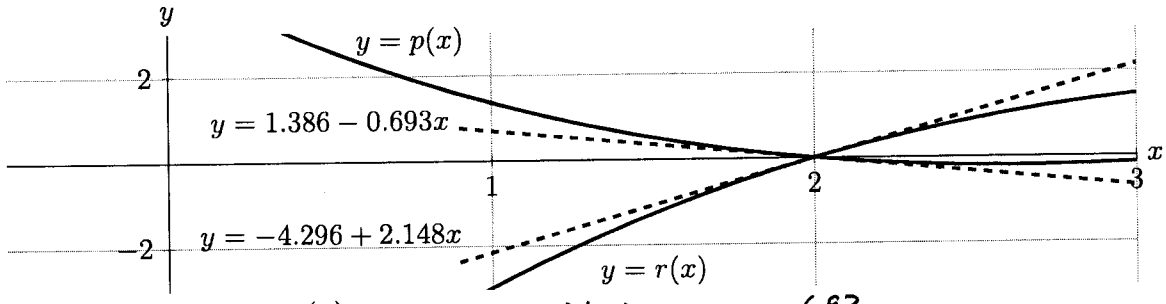
Your answer may involve μ.

$-\frac{(x-\mu)^2}{.0002} = -\frac{(x-\mu)^2}{\frac{2}{10000}} = -\frac{1}{2}(100)^2(x-\mu)^2 = -\frac{1}{2}(100x-100\mu)$.

So let $w = 100x - 100\mu \Rightarrow dw = 100\,dx$

Answer: $\int_{-\infty}^\infty e^{-(x-\mu)^2/0.0002}\,dx =$ $\int_{-\infty}^{\infty} e^{-\frac{1}{2}w^2}\cdot\frac{dw}{100} = \boxed{\frac{\sqrt{2\pi}}{100}}$

d. [3 points] The graph below shows two functions $p(x)$ and $r(x)$, as well as their tangent lines at $x = 2$.



Find the value of $\lim_{x\to 2} \frac{p(x)}{r(x)}$. $= \lim_{x\to 2} \frac{p'(x)}{g'(x)} = \frac{-.693}{2.148}$

by L'Hopital's Rule, since $\frac{0}{0}$

Answer: $\lim_{x\to 2} \frac{p(x)}{r(x)} =$ $-\frac{.693}{2.148}$