exercise 1:

For what values of α in $\mathbb{R}$ does $\displaystyle\int_1^\infty \frac{\arctan x}{x^\alpha} dx$ converge?

exercise 2:

Show that for any $s > 0$, $\displaystyle\int_0^\infty e^{-x^s} dx$ converges.

Hint: first show that $\lim_{x\to\infty} x^2 e^{-x^s} = 0$.

exercise 3:

For what values of p in $\mathbb{R}$ is $\displaystyle\int_0^1 \frac{dx}{x^p}$ convergent?

exercise 4:

Textbook problem 5.1.A: g, h..

exercise 5:

Show that $\displaystyle\int_0^\infty \frac{\cos tx}{1+x^2} dx$ converges for all t in $\mathbb{R}$.

exercise 6:

(i). Given that $\ln x \leq x - 1$ for all $x > 0$, and that just as in exercise 2, $\lim_{x\to\infty} x^3 e^{-x^s} = 0$ if $s > 0$, show that for any $s > 0$, $\displaystyle\int_1^\infty e^{-x^s} \ln x dx$ converges.

(ii). Infer that for any $s > 0$, $\displaystyle\int_0^\infty e^{-x^s} \ln x dx$ converges.