

## 408L CLASS PROBLEMS

MARCH 6TH, 2020

*Problem 1.* Determine whether the following improper integrals converge or diverge. For the integrals that converge, find the value.

(1)  $\int_0^1 x^{-\frac{2}{3}} dx$ .

(2)  $\int_0^1 x^{-\frac{3}{2}} dx$ .

(3)  $\int_0^{\infty} e^{-x} dx$ .

(4)  $\int_1^{\infty} (x^{-\frac{1}{3}} - x^{-\frac{1}{2}}) dx$ .

(5)  $\int_0^{\frac{\pi}{2}} \tan^2(x) dx$

*Problem 2.* Find  $\int_1^{\infty} \frac{\log(x)}{x^2} dx$ .

*Problem 3.* Find an anti-derivative  $\int \frac{dx}{x \log(x)}$ .

Then, using a calculator, find  $\int_1^{10^{100}} \frac{dx}{x \log(x)}$  to a few decimal places.

Does  $\int_1^{\infty} \frac{dx}{x \log(x)}$  converge or diverge?

*Problem 4.* Find  $\int_0^{\infty} \frac{dx}{x^2+3x+2}$ .