

Math 1B

Midterm 3 Review

For sections 5.4–5.5 and 7.1–7.5:

Get together a group of classmates.

Make a copy of the following pages and integrals:

5.4	5-46	7.1	3-46	7.4	7-54
5.5	7-73	7.2	1-35, 47-49, 51-52	7.5	1-82
5.REV	11-40	7.3	4-29	7.REV	1-38

Cut them up, so each question is on a separate slip of paper.

Throw them in a pile and mix them up.

One at a time, randomly pick out a question from the pile and everyone solve it independently.

Compare solutions and discuss which one is fastest/easiest, and how you can recognize what method to use.

The following questions act as a review for 7.8.

[1] Determine if the following integrals converge or diverge. If an integral converges, find its value.

[a] $\int_0^{\infty} x^2 e^{-3x} dx$

[b] $\int_0^{\infty} \frac{1}{\sqrt[3]{x-1}} dx$

[c] $\int_{-\infty}^{\infty} \frac{1}{x^2 + 4} dx$

[d] $\int_{-\infty}^{\infty} \frac{x}{x^2 + 4} dx$

[e] $\int_{-\infty}^0 \frac{e^x}{1 + e^x} dx$

[f] $\int_0^2 \frac{1}{\sqrt{4-x^2}} dx$

[g] $\int_0^2 \frac{x}{\sqrt{4-x^2}} dx$

[h] $\int_0^1 \frac{1}{x(\ln x)^2} dx$

[i] $\int_0^{\pi} \tan x dx$

[2] Determine if the following integrals converge or diverge. Justify your answer.

[a] $\int_1^{\infty} \frac{2 + \sin x}{x} dx$

[b] $\int_1^{\infty} \frac{2 + \sin x}{x^2} dx$

[c] $\int_0^{\infty} e^{-x^2} dx$

[d] $\int_e^{\infty} \frac{1}{\ln x} dx$

[e] $\int_e^{\infty} \frac{1}{x \ln x} dx$

[f] $\int_2^{\infty} \frac{x+1}{\sqrt{x^4-1}} dx$

[g] $\int_1^{\infty} \frac{\cos^2 x}{xe^x} dx$

Answers

[1] [a] $\frac{2}{27}$ [b] diverges [c] $\frac{\pi}{2}$ [d] diverges

[e] $\ln 2$ [f] $\frac{\pi}{2}$ [g] 2 [h] diverges

[i] diverges

[2] [a] diverges – compare to $\frac{1}{x}$ [b] converges – compare to $\frac{3}{x^2}$

[c] converges – compare to e^{-x} [d] diverges – compare to $\frac{1}{x}$

[e] diverges – find antiderivative and take limit [f] diverges – compare to $\frac{1}{x}$

[g] converges – compare to $\frac{1}{e^x}$