

# MATH 21B, practice problems for Midterm 1

*This practice sheet contains more problems than the actual exam.*

1. Compute the integrals:

- a)  $\int e^{2x} dx$
- b)  $\int (x - 3)^7 dx$
- c)  $\int (x - 3)^2 \sqrt{x} dx$
- d)  $\int x \sin(x^2 + 3) dx$
- e)  $\int \frac{1}{x \ln x} dx$
- f)  $\int \frac{2+x^2}{1+x^2} dx$
- g)  $\int \frac{\sin x}{2 \cos x - 1} dx$
- h)  $\int x \sqrt{x - 1} dx$
- i)  $\int \frac{dx}{x^2 + 3x + 2}$

2. Compute the definite integrals:

- a)  $\int_0^3 \frac{1}{1+x^2} dx$
- b)  $\int_0^3 \frac{x}{1+x^2} dx$
- c)  $\int_0^{\pi^2/4} \frac{\cos(\sqrt{x})}{\sqrt{x}} dx$
- d)  $\int_1^5 e^{\ln x} dx$
- e)  $\int_1^5 \frac{(\ln x)^5}{x} dx$
- f)  $\int_{-1}^1 \frac{dx}{x^2 + 2x + 3}$
- g)  $\int_1^2 x \sqrt{x^2 - 1} dx$

3. Find the area

- a) Between the parabola  $y = x^2$  and the line  $y = 3x - 2$
- b) Between the lines  $x = 0$ ,  $y = x$  and  $y = 3 - 2x$ .
- c) Between the hyperbola  $y = 1/x$  and the line  $y = \frac{5}{2} - x$
- d) Between the parabolas  $y = x^2 - 3$  and  $y = 5 - 3x^2$ .

e) Between the graph of  $y = (x^2 - 1)^2$  and the line  $y = 0$ .

f)\* Between the circle  $y = \sqrt{1 - x^2}$ , the line  $y = 0$  and the line  $x = 1/2$ .

4. Find the volume of the body obtained by the rotation around  $x$ -axis of the following region bounded by the lines  $x = 1, x = 4$  and the graph of:

a)  $y = \sqrt{x}$

b)  $y = x^2$

c)  $y = x + 1$

d)  $y = e^x + 1$

5\*. Compute the integral  $\int \frac{dx}{x^4 - 1}$  by using partial fractions twice.