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 $y = 0$.

4*. Compute the integral $\int \frac{dx}{x^2-3x+2}$ by using partial fractions:
(a) Write

$$\frac{1}{x^2 - 3x + 2} = \frac{1}{(x-1)(x-2)} = \frac{A}{x-1} + \frac{B}{x-2}.$$

Find the constants A and B.
(b) Compute the integral

$$\int \frac{dx}{x^2 - 3x + 2} = \int \frac{Adx}{x-1} + \int \frac{Bdx}{x-2}.$$