MAT 17B, Fall 2020
Practice problems for Midterm 1

This practice sheet contains more problems that the actual exam

1. Compute the integral by interpreting it in terms of areas:

a) $\int_0^{10}(x-4)dx$

b) $\int_0^{10}|x-4|dx$

c)* $\int_0^{10}\sqrt{25-(x-5)^2}dx$.

2. Compute the following indefinite integrals:

a) $\int e^{2t}dt$

b) $\int(x-3)^7dx$

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) $\int\frac{\sin x}{2\cos x-1}dx$

g) $\int x\sqrt{x-1}dx$

h) $\int xe^{3x}dx$

3. Compute the following definite integrals:

a) $\int_2^3\frac{1}{x}dx$

b) $\int_0^5\frac{x}{x^2+1}dx$

c) $\int_{\pi^2/4}^{\pi^2}\frac{\cos(\sqrt{x})}{\sqrt{x}}dx$

d) $\int_1^5 e^{\ln x}dx$

e) $\int_1^2 x\sqrt{x^2-1}dx$

4. Find all functions $f(t)$ such that:

a) $f'(t)=\sqrt{t}$

b) $f'(t)=3\sin(t+10)$ and $f(0)=0$

5. A biologist studies a population of bacteria. At the beginning there are 10 bacteria, and the growth rate of the population after t minutes equals $e^{0.5t}$. Find the number of bacteria after an hour.

6**. a) Let $A=\int\sin(x)e^xdx$ and $B=\int\cos(x)e^xdx$. Use integration by parts to verify the equations

$$A=\sin(x)e^x-B,\ B=\cos(x)e^x+A.$$

b) Use part (a) to find A and B.