Practicing exercises-2B

1. Let be given the points $P_1=(0, 2, 0)$, $P_2=(1, 0, 0)$, $P_3=(1, 0, 2)$, and the vector $\underline{a} = 2\underline{i} + \underline{j} + 2\underline{k}$.
   a.) Find the equation of the plane passing through P_1 and perpendicular to the vector $\underline{a}$!
   b.) Find the equation of the plane passing through the points P_1, P_2 and P_3 ! (sol: 2x+y=2)
   c.) Find the equation of the line passing through P_1 and parallell with the vector $\underline{a}$!
   d.) Find the equation of the line passing through P_1 and P_2 ! (sol: x=t ; y=2-2t ; z=0)
2. Find the following integrals: $\int 5x^6 + \sqrt[3]{4x} + \cosh x \, dx$; $\int 2x \cdot \cos\left(7 - x^2\right) dx$
3. Find the following integrals: $\int (x+1) \cdot \cos x \; dx$; $\int \ln(2x+1) \; dx$; $\int e^x \cdot \cosh 2x \; dx \left(= \frac{e^{3x}}{6} - \frac{1}{2e^x} \right)$
4. Find the following integrals: $\int \frac{1}{x^2 + 7x + 12} \; dx$; $\int \frac{1}{(x-1) \cdot x^2} \; dx \left(= \frac{1}{x} + \ln|x-1| - \ln|x| \right)$
5. Find the following integrals: a.) $\int \frac{1}{\sqrt[3]{x} + \sqrt[6]{x}} \; dx$ (subst: $t = \sqrt[6]{x}$) ; b.) $\int \frac{e^{2x}}{e^{2x} - 5e^x} \; dx$ (subst: $t = e^x$)
6. Find the area between $f(x) = 5x - 6$ and $g(x) = x^2$ over the interval [1; 3] !
7. a.) Find the volume of the solid given by the rotation of $f(x) = \sqrt[3]{x}$ over [0; 1] about the x-axis!
   b.) Find the arc length of the function $f(x) = \sqrt{1 - x^2}$ over the interval [0 ; 0,5] ! (sol: $\pi/6$)
8. Find the following improper integrals: a.) $\int_0^2 \frac{1}{\sqrt{x}} \; dx$; b.) $\int_{10}^{\infty} \frac{1}{x^2 - 5x + 6} \; dx$ sol.: *a.)* $2\sqrt{2}$; *b.)* $\ln\left(8/7\right)$
9. $A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & -1 & 3 \end{pmatrix}$ $B = \begin{pmatrix} 0 & 1 & 0 \\ 2 & 3 & 0 \end{pmatrix}$ Find A+3B ; A*B ; B*A ; Show that $\left(A \cdot B^T\right)^{-1} = \frac{1}{2} \cdot \begin{pmatrix} -3 & -2 \\ 1 & 0 \end{pmatrix}$