

MA 1201 Semester B 2018/19

Assignment 1 — Due at 5 pm, 21/2/2019 (Thursday) in tutorial classes

Instructions:

- Please show your work. Unsupported answers will receive **NO** credits.
- Make sure you write down the correct lecture session (A/B/C/D/E/F/G/H) you have registered for, together with your full name and student ID on the front page of your answer script. Hand your solution to your TA in tutorial class before the deadline.
- In case your tutorial class is scheduled on days other than Thursday, you may choose to hand your solution to your TA in one of the tutorial classes scheduled on Thursday.
- **NO** late homework will be accepted. Homework submitted to wrong tutorial sessions will **NOT** be graded and will receive **0 POINTS**.

Recall that the vector equation for a line L passing through a point $P_0(x_0, y_0, z_0)$ parallel to a vector $\vec{v} = \langle v_1, v_2, v_3 \rangle$ is

$$\vec{r}(t) = \vec{r}_0 + t\vec{v}, \quad -\infty < t < \infty,$$

where $\vec{r}$ is the position vector of a point $P(x, y, z)$ on L and $\vec{r}_0$ is the position vector of $P_0(x_0, y_0, z_0)$. In component form, the vector equation is equivalent to three scalar equations:

$$\begin{cases} x = x_0 + tv_1 \\ y = y_0 + tv_2 \\ z = z_0 + tv_3 \end{cases}.$$

1. (10 points) Find the point of intersection of the lines

$$\begin{cases} x = t \\ y = -t + 2 \\ z = t + 1 \end{cases} \quad \text{and} \quad \begin{cases} x = 2s + 2 \\ y = s + 3 \\ z = 5s + 6 \end{cases},$$

and then find the equation of the plane determined by these lines.

2. (15 points) Find the distance from the line

$$\begin{cases} x = t + 2 \\ y = t + 1 \\ z = -\frac{1}{2}(t + 1) \end{cases}$$

to the plane $x + 2y + 6z = 10$. (Hint: Explain first why the line is parallel with the plane (the normal vector of the plane is perpendicular to the direction vector of the line). Then pick an arbitrary point A on the line and an arbitrary point B on the plane. Project the vector $\vec{AB}$ (orthogonally) onto the normal vector of the plane, and find the length of the projected vector.)

3. (50 points) Evaluate the following indefinite integrals.

(a) (15 points) $\int \frac{x+1}{2x^2-4x+9} dx.$

Session:

Name:

Student ID:

(b) (15 points) $\int \frac{3x^2 + 4}{\sqrt{2x + 1}} dx.$

(c) (10 points) $\int \frac{1}{x} \sqrt{x^2 - 1} dx.$

(d) (10 points) $\int \frac{1}{1 + e^{2x}} dx.$

4. (25 points) Evaluate the following definite integrals.

(a) (10 points) $\int_1^4 e^{|x-2|} dx.$

(b) (15 points) $\int_{-\pi/3}^{\pi/3} (|x| + \tan x)^2 dx.$ (Hint: No integration by parts is needed.)

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