MA 261 Quiz 1
August 28, 2018

If you do not know how to do any one of these problems, circle "**(E) I don't know**" as your answer choice. You will receive **one point** for doing that. **Each problem** is worth **five points**. You get **two points** for writing your **full name** and **three points** for writing your **PUID and section number**.

Problem 1.1. Which of the following lines passes through $(0, 12, -6)$ and is parallel to the line $x = -1 + 4t, y = 6 - 4t, z = 3 + 9t$?

(A) $\mathbf{r}(t) = (12 - 4t)t\mathbf{i} + (-6 + 9t)\mathbf{j} + 4\mathbf{k}$.

(B) $\mathbf{r}(t) = -4t\mathbf{i} + (12 - 9t)\mathbf{j} + (-6 + 4t)\mathbf{k}$.

(C) $\mathbf{r}(t) = 4t\mathbf{i} + (12 - 4t)\mathbf{j} + (-6 + 9t)\mathbf{k}$.

(D) $\mathbf{r}(t) = -4t\mathbf{i} + (12 - 4t)\mathbf{j} + (-6 - 9t)\mathbf{k}$.

(E) I don't know.

Solution. The correct answer was (C). Here is the solution: A line in $\mathbf{R}^3$ is determined by its unit direction vector $\mathbf{u}$. Therefore, all we need to do is check that one of the answer choices is a line with the same unit direction vector as $\mathbf{s}(t) = (-1 + 4t)\mathbf{i} + (6 - 4t)\mathbf{j} + (3 + 9t)\mathbf{k}$, whose direction vector is $(4, -4, 9)$. And it is quite easy to see that the only line from the given answer choices which has the same unit direction vector will be the one in choice (C). Moreover, the line passes through the point $(0, 12, -6)$. ◆

Problem 1.2. Which plane passes through the point $(2, -7, -8)$ and is parallel to the plane $3x - y - z = 5$?

(A) $2x - 7y - 8z = 0$.

(B) $3x - y - z = 5$.

(C) $3x - y - z = 21$.

(D) $3x - y - z = 22$.

(E) I don't know.

Solution. The correct answer is (C). A plane which is parallel to $3x - y - z = 5$ must also have the same normal vector $(3, -1, -1)$. This leaves (B), (C), and (D) as potential answer choices. However, $(2, -7, -8)$ must also be a point in that plane. Since $3 \cdot 2 - (-7) - (-8) = 21$, the plane must be the one given in choice (C). ◆

Problem 1.3 (Spring 2016, Problem 2). The plane passing through the point $(0, 1, 0)$ and parallel to the plane $x + y - 2z = 3$ intersects the x-axis at the point:

(A) $(-1, 0, 0)$.

(B) $(1, 0, 0)$.

(C) $(-2, 0, 0)$.

(D) $(2, 0, 0)$.

(E) I don't know.

Solution. The correct answer is (B). This problem is actually from the first midterm of Spring 2016; so kudos to you if you got it right. First, we need to find plane parallel to $x + y - 2z = 3$. So our plane must have the form $x + y - 2z = d$. Now, we are told that our plane passes through $(0, 1, 0)$ so $0 + 1 - 2 \cdot 0 = d$, which tells us that the plane must be $x + y - 2z = 1$. Lastly, for our plane to intersect the x-axis, both y and z must be 0, so $x + 0 - 2 \cdot 0 = 1$ tells us that the x-intercept is $(1, 0, 0)$. $\blacklozenge$