MATH 230 **Name:** _____
Written HW 2
Planes, Vector-Valued Functions, Parametrizations

Instructions:

- **Map your answers to the right question in GradeScope at the time of upload**. **Answers must be organized and legible**. Points may be deducted if anything is unclear about the process of your work.
- Points will be deducted for incomplete reasoning and disorganized work (even if your answers are correct).
- If you have any difficulties/questions, you are encouraged to discuss these problems with me.

1. A triangle is formed by the points $P = (1, 1, 3)$, $Q = (4, -1, 3)$, and $R = (7, 1, -2)$.
   (a) Sketch the triangle.
   (b) Find both the **vector and scalar equations** of the plane containing this triangle.

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2. Where does the line $\mathbf{r}(t) = \langle 1, 4, 2\rangle + t\langle -1, -3, 5\rangle$ intersect the plane $3x - 5y + 9z = 2$, if at all?

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3. Given the equation of the line
$$\mathbf{r}(t) = \langle 1, 2, 4\rangle + t\langle 3, 1, 5\rangle$$
and the plane
$$2x + 7y - 8z = 4$$
determine each of the following.
   (a) The angle, θ_1, between the line and the plane such that $0 \leq \theta_1 \leq \pi/2$.
   (b) The angle, θ_2, between the line and the plane such that $\pi/2 \leq \theta_2 \leq \pi$

   You do not need to approximate the value on a calculator. You may leave the answer with $\cos^{-1}$ in it.

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4. Find the equation of the plane orthogonal to the line
$$\mathbf{r} = \langle 0, 5, 2\rangle + t\langle -1, 8, 2\rangle$$

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5. Parametrize the circle of radius 9 with center $P = (2, 1, -9)$ parallel to the xy-plane.

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6. Let C be the path parameterized by
$$\mathbf{r}(t) = \langle t, t^2, \sqrt{t-2}\rangle$$
   (a) Write the equation of the curve corresponding to its xy projection. That is, write the equation in terms of x and y. Sketch the graph of this projection.
   (b) Write the equation of the curve corresponding to its xz projection. That is, write the equation in terms of x and z. Sketch the graph of this projection.

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7. Parametrize the intersection of the surfaces $z = x^2 + y^2 - 2$ and $z = 9 - x^2 - y^2$ using trigonometric parametrization.