

Directions: Do not simplify unless indicated. No calculators are permitted. Show all work as appropriate for the methods taught in this course. Partial credit will be given for any work, words or ideas which are relevant to the problem.

Please put problem 1 on answer sheet 1

1. (a) Sketch the sphere with equation $x^2 + 4x + y^2 + z^2 - 6z = 3$. Mark the center and some point on the sphere with their coordinates. [10 pts]
 - (b) Find the symmetric equation of the line passing through $(3, 2, 1)$ and perpendicular to the plane $4x + 2y - z = 1$. [10 pts]
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Please put problem 2 on answer sheet 2

2. Let \mathcal{P} be the plane containing the points $Q = (0, 0, 1)$, $R = (2, 3, 4)$ and $S = (0, 2, 2)$.
 - (a) Write the equation of the plane \mathcal{P} in the form $ax + by + cz = d$. [15 pts]
 - (b) Determine if the point $(1, 1, 1)$ is on the plane \mathcal{P} . [5 pts]
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Please put problem 3 on answer sheet 3

3. (a) Sketch the curve with the following parametrization and label the start and end points with their coordinates: [10 pts]

$$\mathbf{r}(t) = t^2 \mathbf{i} + t \mathbf{j} + 1 \mathbf{k} \text{ with } 0 \leq t \leq 2$$

- (b) Find a parametrization of the top half of the circle of radius 3 centered at $(1, 2)$ in the xy -plane. [10 pts]
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Please put problem 4 on answer sheet 4

4. (a) Suppose a curve has parametrization $\mathbf{r}(t) = 3t^2 \mathbf{i} + 5t \mathbf{j} + (1 - t) \mathbf{k}$ for $0 \leq t \leq 1$. Find the tangential component of acceleration at $t = 2$. [10 pts]
 - (b) Determine where the curve with parametrization $\mathbf{r}(t) = t^2 \mathbf{i} + t \mathbf{j} + t \mathbf{k}$ intersects the sphere $x^2 + y^2 + z^2 = 8$. [10 pts]
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Please put problem 5 on answer sheet 5

5. Let \mathcal{L} be the line containing the points $P = (1, 2, 0)$ and $R = (2, 5, 1)$. Find the distance between the line \mathcal{L} and the point $Q = (4, 5, 5)$. [20 pts]
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The End and the TA Section List

Chenzhi	0311 ↔ 8:00	0321 ↔ 9:30
Corry	0312 ↔ 8:00	0322 ↔ 9:30
Noah	0331 ↔ 11:00	0341 ↔ 12:30
Papia	0332 ↔ 11:00	0342 ↔ 12:30