Math 241 Exam 1 Sample 2

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. Let l be the line containing the points $P = (4, -2, 2)$ and $Q = (2, 1, 7)$.

    (a) Find the parametric equations for l.   [5 pts]

    (b) Find the vector equation for l.   [5 pts]

    (c) Find the point at which l intersects the plane $2x - 3y + 10z = -3$.   [10 pts]

Please put problem 2 on answer sheet 2

2. (a) Sketch the plane $2x + y = -10$.   [10 pts]

    (b) Find the curvature of $\bar{r}(t) = 2t\,\hat{\imath} + t^2\,\hat{\jmath} + \frac{1}{3}t^3\,\hat{k}$.   [10 pts]

Please put problem 3 on answer sheet 3

3. (a) Find the distance between the point $Q = (5, 3, 1)$ and the line given by the symmetric   [10 pts] equations
$$\frac{x-2}{4} = y - 3 = \frac{z-1}{5}$$

    (b) Given that $\bar{u} = \hat{\imath} - \hat{\jmath} - 4\,\hat{k}$ and $\bar{v} = 2\,\hat{\imath} + 3\,\hat{\jmath} - \hat{k}$. Find $\text{Proj}_{\bar{u}}\bar{v}$.   [10 pts]

Please put problem 4 on answer sheet 4

4. (a) Find the equation of the plane containing both the the line $\bar{r}(t) = (1+2t)\,\hat{\imath} + (3-7t)\,\hat{\jmath} + 2\,\hat{k}$ [10 pts] and the point $(1, 2, 3)$. Express your plane as $ax + by + cz = d$.

    (b) Sketch the graph of the vector valued function $\bar{r}(t) = \cos t\,\hat{\imath} + \sin t\,\hat{\jmath} + t\,\hat{k}$ for $0 \leq t \leq 2\pi$ [10 pts] Indicate the direction in which t is increasing. Label the start and end points with their coordinates.

Please put problem 5 on answer sheet 5

5. (a) Give a parametrization of the oriented curve shown.   [10 pts]
The curve is a quarter circle of radius 3.
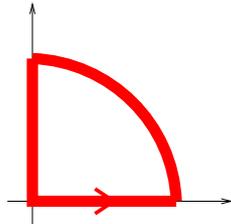
    (b) Find the position vector $\bar{r}(t)$ satisfying that $\bar{a}(t) = \hat{\imath} + 2\,\hat{\jmath}$, $\bar{v}(1) = \bar{0}$ and $\bar{r}(0) = \hat{k}$.   [10 pts]

The End