Math 241 Exam 1 ෴ 2020 **ĵustîn Wyss-Gallîfent**

Directions: Do not simplify non-Calc3 things 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, pictures or ideas which are relevant to the problem.

Please put problem 1 on answer sheet 1

1. (a) Suppose the points $(1,2,3)$ and $(3,8,7)$ are on opposite sides of a sphere. Write down the equation of the sphere. [10 pts]

   (b) Suppose $\mathbf{a} = 2\hat{\boldsymbol{\imath}} + 8\hat{\boldsymbol{\jmath}} + 1\hat{\boldsymbol{k}}$ and $\mathbf{b} = 3\hat{\boldsymbol{\imath}} - 4\hat{\boldsymbol{\jmath}} + 7\hat{\boldsymbol{k}}$. Find the projection of $\mathbf{a}$ onto $\mathbf{b}$. [10 pts]

Please put problem 2 on answer sheet 2

2. Find the equation of the plane containing the point $Q = (1,-1,2)$ and containing the line with parametrization $\mathbf{r}(t) = (2t+1)\hat{\boldsymbol{\imath}} + (t-3)\hat{\boldsymbol{\jmath}} + (4-5t)\hat{\boldsymbol{k}}$. Write this in the form $ax + by + cz = d$. [20 pts]

Please put problem 3 on answer sheet 3

3. (a) Write down a parametrization of the straight line from $(1,-4,3)$ to $(8,4,2)$. [5 pts]

   (b) Find the distance between the parallel planes $2x + 3y + 10z = 10$ and $2x + 3y + 10z = 20$. [15 pts]

Please put problem 4 on answer sheet 4

4. Given the curve with parametrization

$$\mathbf{r}(t) = t\hat{\boldsymbol{\imath}} + 2\hat{\boldsymbol{\jmath}} + t^2\hat{\boldsymbol{k}} \text{ for } -1 \leq t \leq 1.$$

   (a) Sketch the curve. Mark the start and end points with their coordinates. [10 pts]

   (b) Is the parametrization closed or not? Justify. [5 pts]

   (c) Is the parametrization smooth, piecewise smooth or neither? Justify. [5 pts]

Please put problem 5 on answer sheet 5

5. Consider the parametrization $\mathbf{r}(t) = t^2\hat{\boldsymbol{\imath}} + (1-t^3)\hat{\boldsymbol{\jmath}} + 2\hat{\boldsymbol{k}}$.

   (a) Find $\mathbf{T}(1)$. [10 pts]

   (b) Find the tangential component of acceleration at $t = 1$. [10 pts]

The End and the TA Section List

Vlassis	0211 ↔ 8:00	0221 ↔ 9:00
Michael	0212 ↔ 8:00	0222 ↔ 9:00
Luis	0231 ↔ 10:00	0241 ↔ 1:00
Tao	0232 ↔ 10:00	0242 ↔ 1:00