

Name:

Notice:

1. Please box your final answer.
2. Please stop writing when time is up.

**Problem 1 (5 points):**

Let  $\vec{a} = \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$  and  $\vec{b} = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}$ . Compute:

1.  $\|\vec{a}\|$
2.  $2\vec{a}$
3.  $\|2\vec{a}\|^2$
4.  $\vec{a} + \vec{b}$
5.  $3\vec{a} - \vec{b}$

$$1. \sqrt{1+4+9} = \sqrt{14}$$

$$2. \begin{pmatrix} 2 \\ -4 \\ 6 \end{pmatrix}$$

$$3. 56$$

$$4. \begin{pmatrix} 3 \\ -3 \\ 4 \end{pmatrix}$$

$$5. \begin{pmatrix} 1 \\ -5 \\ 8 \end{pmatrix}$$

**Problem 2 (5 points):**

Given a curve  $\vec{x}(t) = \begin{pmatrix} t \\ t^2 \\ t^3 \end{pmatrix}$ , compute:

1. The tangent vector:  $\vec{x}'(t)$

2. For which values of the number  $t$ , are  $\vec{x}'(t)$  and  $\begin{pmatrix} 1 \\ 3 \\ 3 \end{pmatrix}$  perpendicular?

$$1. \vec{x}'(t) = \begin{pmatrix} 1 \\ 2t \\ 3t^2 \end{pmatrix}$$

$$2. \begin{pmatrix} 1 \\ 2t \\ 3t^2 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 3 \\ 3 \end{pmatrix} = 1 + 6t + 9t^2 = (3t+1)^2 = 0 \Rightarrow t = -\frac{1}{3}$$