

North Carolina State University
MA 242 Section 008 Exam 1 Practice

- 1) Know all properties of the dot product and cross product.
- 2) For the following vectors compute $\vec{a} \cdot \vec{b}$, $\vec{a} \times \vec{b}$, and $\text{proj}_{\vec{b}} \vec{a}$. Are \vec{a} and \vec{b} orthogonal?
 - I) $\vec{a} = \langle 1, 1, 1 \rangle$, $\vec{b} = \langle 2, 0, -2 \rangle$
 - II) $\vec{a} = i - j + k$, $\vec{b} = 2i + 4j - 2k$
- 3) Find an equation of the line passing through the point $(0, 2, 3)$ parallel to vector $\langle 2, -1, 1 \rangle$.
- 4) Find an equation of a plane that contains the line in problem 2) and the origin.
- 5) For the vector valued functions $\vec{u}(t) = \langle e^{t^2}, 4, \ln(t) \rangle$ and $\vec{v}(t) = \langle t, t^3, \frac{1}{t} \rangle$ compute
 - a) $\vec{u}'(t)$ and $\vec{v}'(t)$
 - b) $\frac{d}{dt} [\vec{u}(t) \cdot \vec{v}(t)]$
 - c) $\int (\vec{u}(t) \cdot \vec{v}(t)) dt$
- 5) Reparametrize the curve $\vec{r}(t) = 3 \cos(t)i + 2j + 3 \sin(t)k$ with respect to arc length.
- 6) Find T, N, B, κ for the helix

$$\vec{r}(t) = \cos(t)i + \sin(t)j + tk$$

- 7) Find the velocity, acceleration, and speed of a particle with the position function $\vec{r}(t) = \langle t^2 + 1, t^3, t^2 - 1 \rangle$.
Could we start with the acceleration vector and get the position vector? What operation(s) would we need to do?