

Math 2210-1. Practice Test 1. Fall 2007.

Name: _____

September 15, 2007

Problem 1: _____ /40

Problem 2: _____ /20

Problem 3: _____ /30

Problem 4: _____ /30

Problem 5: _____ /30

Total: _____ /150

Instructions: The exam is closed book, closed notes and calculators are not allowed. You are only allowed one A4-size sheet of paper with anything on it.

You will have 50 minutes for this exam. The point value of each problem is written next to the problem - use your time wisely. Please show all work, unless instructed otherwise. Partial credit will be given only for work shown.

Problem 1 (40 points) Let $\vec{u} = 2\vec{i} - \vec{j} + 2\vec{k}$ and $\vec{v} = 5\vec{i} + \vec{j} - 3\vec{k}$ be two vectors.

- (1) Draw a sketch of vector \vec{u} in the xyz -coordinate system.
- (2) Find the cosine of the angle between \vec{u} and \vec{v} .
- (3) Find the area of the triangle which has two sides \vec{u} and \vec{v} .

Problem 2(20 points) Find the length of the curve

$$\vec{r}(t) = 3 \cos(2t)\vec{i} + 3 \sin(2t)\vec{j} + 4t\vec{k},$$

between the points $P(3, 0, 0)$ and $Q(0, 3, \pi)$.

Problem 3(30 points) Consider the position vector

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

- (1) Find the acceleration $\vec{a}(t)$.
- (2) Find the normal and tangential components of the acceleration a_N and a_T .
- (3) What curve does $\vec{r}(t)$ describe?

Problem 4(30 points)

- (1) Find the parametric equations of the line containing the point $P(0, 1, 2)$ and parallel to the planes $2x - y + 3z = 5$ and $-x + 2y + 2z = 3$.
- (2) Is this line parallel also to the plane $x + 3y - z = 2$?

Problem 5(30 points) Consider the surface given by the equation

$$x^2 + y^2 - 3z^2 = 1.$$

- (1) Graph the surface by hand showing the intersections (traces) with the coordinate planes.
- (2) Write the equation of the surface in spherical coordinates.