

Math 173 - Extra Pts 1

March 9, 2017

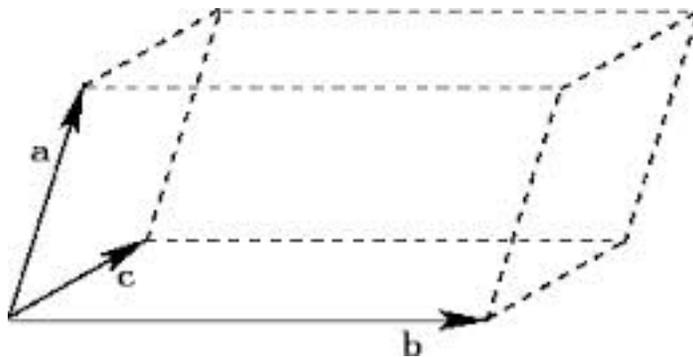
Name _____

Score _____

By doing the problems included here, you can make up to 1/3 of the points you missed on Test 1. Show all work to receive full credit. Supply explanations where necessary.

1. (6 points) The vector \vec{u} is the 2D vector that has magnitude 4 and makes a 45° angle with the positive x -axis. The vector \vec{v} is the 2D vector of magnitude 5 that is perpendicular to the graph of $y = x^3 - x$ at the point $x = 1$. Find \vec{u} , \vec{v} , and $2\vec{u} - \vec{v}$.

2. (4 points) A crystal structure has the form of a parallelepiped determined by the vectors $\vec{a} = 2\hat{i} - 3\hat{j} + 5\hat{k}$, $\vec{b} = -2\hat{i} - 4\hat{j} + \hat{k}$, and $\vec{c} = 3\hat{i} - 3\hat{j} + 2\hat{k}$, where distances are measured in micrometers. Find the area of the base determined by the vectors \vec{b} and \vec{c} . Then determine the volume of the parallelepiped.



3. (3 points) Suppose A , B , and C are noncollinear points in 3-space. Prove analytically that $\vec{AB} + \vec{BC} = \vec{AC}$.

4. (5 points) Consider the vector-valued function $\vec{r}(t) = 3 \sin t \hat{i} - 2 \cos t \hat{j}$.

(a) Eliminate the parameter t to determine an equation in the variables x, y for the graph of \vec{r} .

(b) Sketch a careful graph of $\vec{r}(t)$. Indicate the orientation (direction of increasing t).

(c) Without actually computing them, sketch (on your graph) $\hat{T}(t)$ and $\hat{N}(t)$ at the point at which the graph has greatest curvature.

5. (6 points) A car is pushed horizontally off an 81-ft high seaside cliff with a speed of 4 ft/s. Find the speed at which the car hits the water. (Ignore all forces except gravity.)

6. (6 points) Give a detailed description of the graph of each equation in 3-space.

(a) $yz = 1$

(b) $-2x^2 + 4y^2 + z^2 = -36$

(c) $z = 4 - x^2 - y^2$