

Name: _____

Date: _____

Test Prep — 12.1 and 12.2 Homework Session — Math 126

Note: Today is a homework-focused quiz section. In future weeks we will start with a short Test Prep (old exam problem), then shift to homework.

Course Participation:

- +1: show written work for at least two 12.1 and/or 12.2 homework problems
- +1: participate in this Test Prep (turn this in)

Make sure your TA marks both your homework and this sheet.

Candy Pt: One per week for presenting or helping correct work (earns candy, not grade points).

Part 1: Test Prep Format

1. Start the first problem on your own for a few minutes while the TA checks homework.
 2. Then compare and discuss with classmates.
 3. Then discuss with your TA.
 4. After that, continue with the other problems below, which come from 12.2 HW.
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Part 2: Start Here — Exam Style Problem

Start here. Work quietly for a few minutes before discussing.

This problem comes directly from an old Math 126 exam. It is similar in spirit to the more challenging sphere problem in the 12.1 homework. The goal is to translate the words into a distance equation and then simplify until you recognize a sphere.

Old Exam Problem: Find the center and radius of the sphere with points $P(x, y, z)$ such that the distance from P to $A(0, 0, 2)$ is triple the distance from P to $B(0, 0, 0)$.

Candy Pt (group): Someone from your group sets up the correct distance equation on the board and simplifies to give the sphere equation.

1. *Vector Addition*

Find the sum of the given vectors: $\mathbf{a} = \langle 4, -4 \rangle$, $\mathbf{b} = \langle -2, 6 \rangle$. Also give a geometric picture of the vectors and their sum.

Candy Pt (group): Someone from your group draws the correct geometric picture of $\mathbf{a} + \mathbf{b}$ on the board.

2. *Unit Vector*

Find a unit vector that has the same direction as the given vector: $-3\mathbf{i} + 7\mathbf{j} = \langle -3, 7 \rangle$.

3. *Same Direction, Given Length*

Find a vector that has the same direction as $\langle -2, 4, 2 \rangle$ but has length 6.

Candy Pt (group): Someone from your group shows the scaling step clearly on the board.

4. Tangent Direction

Find the unit vectors that are parallel to the tangent line to the curve $y = 2 \sin(x)$ at the point $(\frac{\pi}{6}, 1)$. What does it mean that there are two answers? What does it mean to list them in order of their \mathbf{i} component?

5. Perpendicular Direction

Find the unit vectors that are perpendicular to the tangent line above.

Candy Pt (group): Someone from your group writes the answer on the board and explains it.

6. Geometric Description

If $\mathbf{r} = \langle x, y, z \rangle$ and $\mathbf{r}_0 = \langle x_0, y_0, z_0 \rangle$, describe the set of all points (x, y, z) such that

$$|\mathbf{r} - \mathbf{r}_0| = 2.$$

What geometric object does this describe?

Candy Pt (group): Someone from your group explains clearly why this represents a sphere and identifies its center and radius.

If you finish, switch to the 12.2 homework and continue working with your group.

This is an old exam problem provided to show you examples of some of the skills we are building in 12.1 through 12.4.

Winter 2015 - Exam 1 - Dr. Loveless

NOTE: Only try part (c) now (it only requires 12.2 skills — the basics of what a vector tells you).

Part (a) requires 12.5 (planes), which we will do next week.

Part (b) can be done with 12.4 (cross-products).

Part (d) can be done with 12.3 (dot products).

So ignore (a), (b), and (d) for now, but do attempt part (c).

2. (14 pts) Consider the triangle shown.

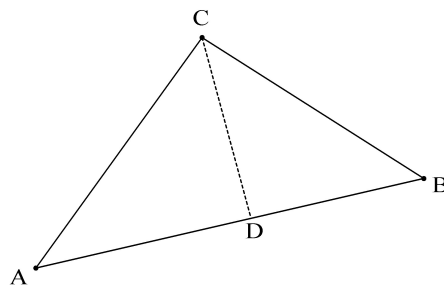
The coordinates for C are $(4, 3, 1)$.

You are given $\overrightarrow{BA} = \langle -2, -1, 3 \rangle$ and $\overrightarrow{BC} = \langle -1, 1, 4 \rangle$.

The dotted line CD is perpendicular to BA .

Answer the following questions (leave your answer in exact form; you do not have to simplify).

(a) (5 pts) Find the equation of the plane that contains the points A , B , and C .



(b) (3 pts) Find the area of the triangle ABC .

(c) (3 pts) Find the coordinates for the point A .

(d) (3 pts) Find the distance from B to D .