Section ___________ **Name** ____

TA ________________ **Student Number** ________________________________

Mathematics 126 **Calculus With Analytic Geometry III** **Fall 1995**

MIDTERM EXAM

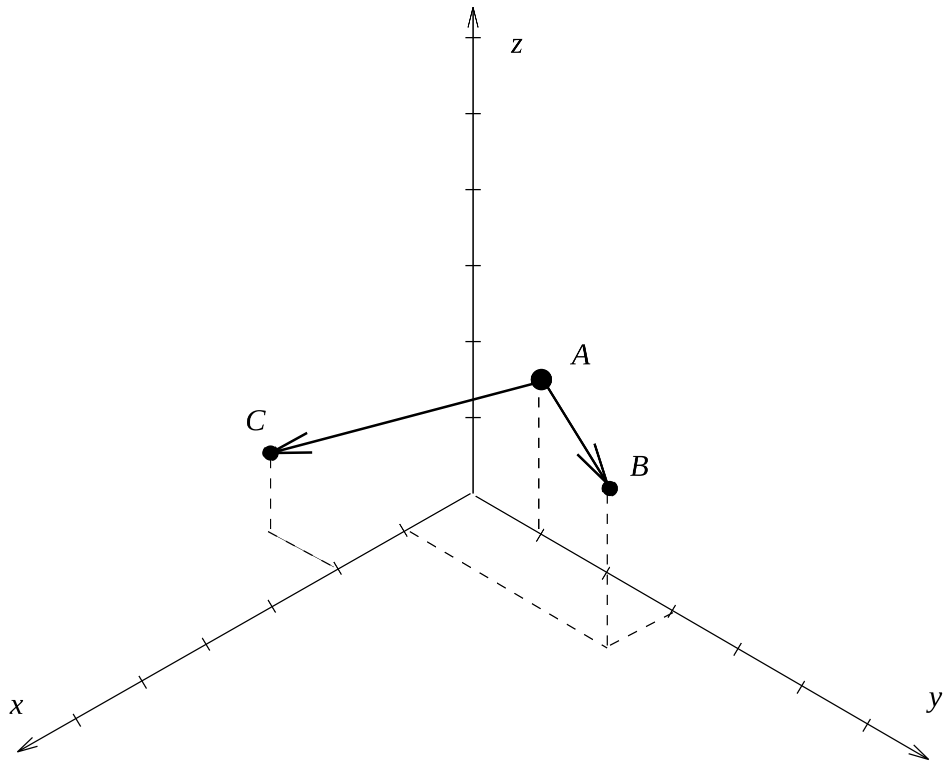
10/30/95

- There are 4 problems at 25 points each, for a total of 100 points.
- Tests with wrong or incorrectly spelled TA names or section letters will lose 4 points.
- You may use two $8\frac{1}{2}''$ by $11''$ one-sided pages (or one sheet written on both sides) of your own handwritten notes (no photocopied or printed material). You may also bring a small model of the xyz-axes to the test.
- *Show your work:* If your work demonstrates that you had the right idea, you might get partial credit even if your answer is wrong. On the other hand, if your answer is not justified by your work, you might lose points even if your answer is correct.
- Use the boxes for answers when possible. Measurements must be made with a ruler, and lines and vectors must be drawn with a ruler. Lines or vectors drawn without a ruler lose 4 points.
- Calculators are allowed, but you won't need one; we prefer that you leave numerical answers in unsimplified form. Laptop computers are not allowed.
- Simplify algebraic and numerical expressions in answers to the point where they can be evaluated by a student in a precalculus course with a calculator, but you do not need to take them any further. Leave exact answers in exact form.
- If you have a question, raise your hand and I will come to your seat.

For grader's use only

1:	
2:	
3:	
4:	
Total:	

1. The vectors $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are shown in the diagram below.



(a) Write the components of $\overrightarrow{AB}$ and $\overrightarrow{AC}$.

$\overrightarrow{AB} =$

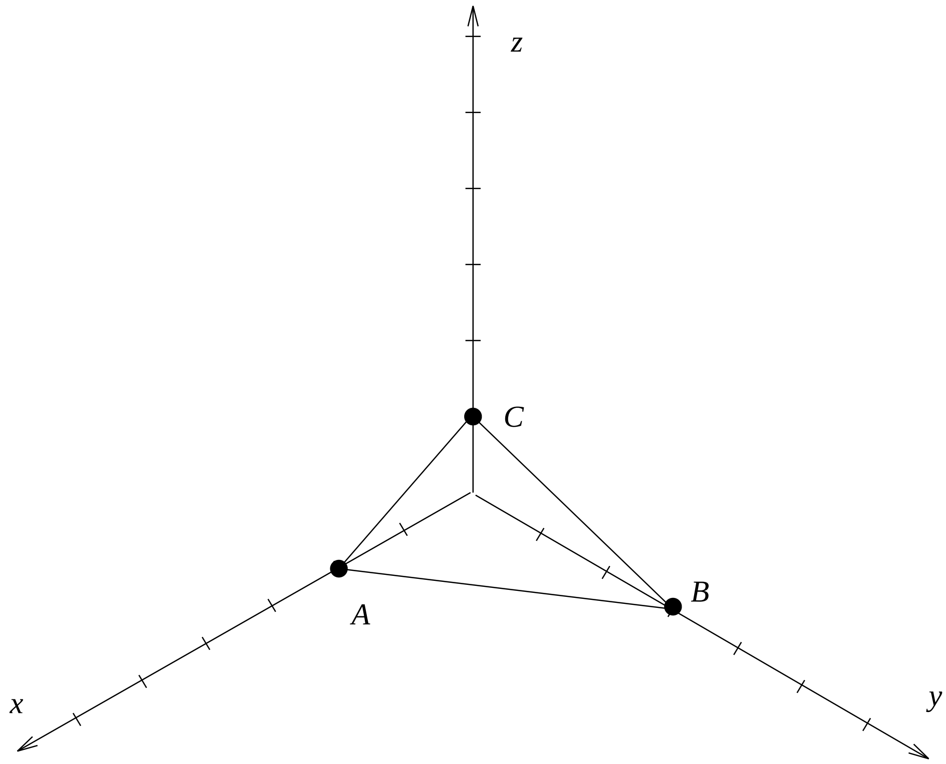
$\overrightarrow{AC} =$

(b) Find the components of a vector $\vec{v}$ parallel to $\overrightarrow{AC}$ and a vector $\vec{w}$ perpendicular to $\overrightarrow{AC}$ such that $\overrightarrow{AB} = \vec{v} + \vec{w}$.

$\vec{v} =$

$\vec{w} =$

2. The plane β passes through the three points A, B, and C shown below.



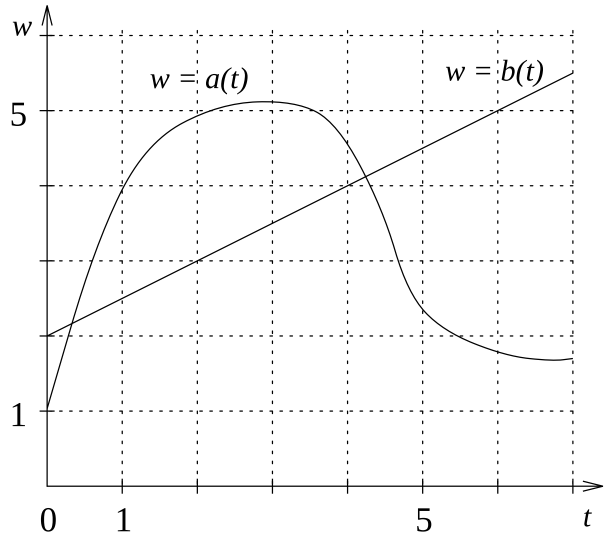
(a) Find the components of a vector $\vec{n}$ of length 3 which is normal to β.

$\vec{n} =$ $\boxed{}$

(b) Find a parameter representation for the line normal to β which goes through the point B.

Line normal to β: $\boxed{}$

3. A point $P(t)$ moves in the xy-plane along a curve C. Its position at time t seconds is given by $(x, y) = (a(t), b(t))$, where $a(t)$ and $b(t)$ are the functions defined by their graphs below.



(a) Find the coordinates of the point $P(t)$ at time $t = 4$.

Coordinates = $\boxed{}$

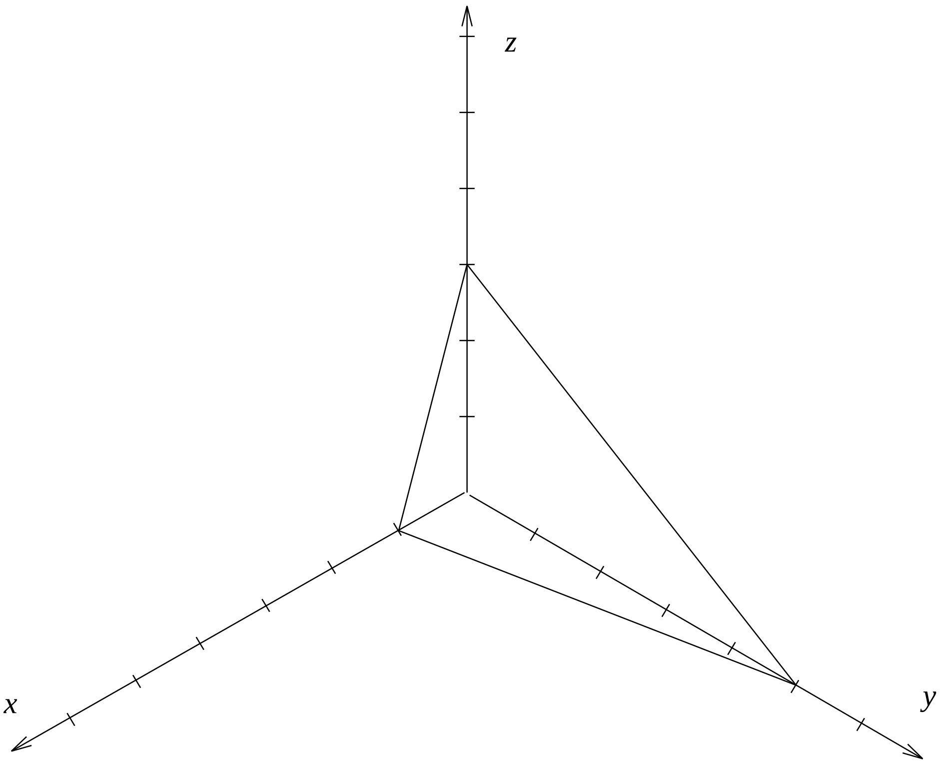
(b) Find the components of the velocity vector at the same time $t = 4$.

Velocity = $\boxed{}$

(c) Between times $t = 3$ and $t = 6$ the speed of P (circle one):

always increases	first increases then decreases	always decreases	first decreases then increases	impossible to tell

4. Let α be the plane $15x + 3y + 5z = 15$ shown below.



On the left of each statement below circle one of the three choices: **T** (true), **F** (false), or **??** (impossible to decide on the basis of the given information). You don't need to show work to get credit for a correct answer.

T **F** **??** (a) α is a level object of the function $g(x, y) = 15x + 3y - 15$.

T **F** **??** (b) α is the graph of the function $f(x, y, z) = 15x + 3y + 5z$.

T **F** **??** (c) α is the graph of the function $g(x, y) = 15x + 3y - 15$.

T **F** **??** (d) α is a level object of the function $f(x, y, z) = 15x + 3y + 5z$.

T **F** **??** (e) α is the normal object of the line $(x, y, z) = (1 + 15t, 3t, 5t)$ at the point $(1, 0, 0)$.