PART A (18 marks)

NOTE: YOUR ANSWERS TO THE PROBLEMS IN PART A MUST BE INDICATED ON THE SCANTRON SHEET. YOU SHOULD ALSO CIRCLE YOUR ANSWERS IN THIS BOOKLET.

Use the following for questions 1, 2 and 3.

Let $\mathbf{u} = (1, -2, 3)$ and $\mathbf{v} = (3, -2, 2)$.

1 mark 1. Find $\mathbf{u} - 2\mathbf{v}$.

A: $(-5, 4, 1)$	B: $(-2, 0, 1)$	C: $(5, -2, 1)$	D: $(-5, 2, -1)$	E: $(4, -4, 6)$

1 mark 2. Find $\|\mathbf{u} - \mathbf{v}\|$.

A: $\sqrt{14} - \sqrt{17}$	B: -3	C: $\sqrt{5}$	D: 1	E: 0

1 mark 3. Find $\mathbf{u} \bullet \mathbf{v}$.

A: $(3, 4, 6)$	B: $(4, -4, 5)$	C: 5	D: $\sqrt{14}\sqrt{17}$	E: 13

1 mark 4. Find the value of k for which the vectors $\mathbf{u} = (2, -2, 4, 3)$ and $\mathbf{v} = (1, 3, -2, k)$ are orthogonal (perpendicular).

A: 4	B: -4	C: 0	D: 2	E: -1

1 mark 5. Find $\cos\theta$ where θ is the angle between the vectors $\mathbf{u} = (3, -2, 1, 3)$ and $\mathbf{v} = (1, 3, -2, 3)$.

A: $\dfrac{4}{2\sqrt{5}}$	B: $\dfrac{2}{5}$	C: 0	D: $\dfrac{4}{23}$	E: $\dfrac{3}{13}$

1 mark 6. Which one of the following is *not* a unit vector?

A: $(1, 0, 0)$	B: $(0, -1, 0)$	C: $\left(\dfrac{1}{\sqrt{2}}, \dfrac{1}{\sqrt{2}}, 0\right)$	D: $\left(\dfrac{1}{\sqrt{3}}, \dfrac{1}{\sqrt{3}}, -\dfrac{1}{\sqrt{3}}\right)$	E: $\left(\dfrac{1}{3}, \dfrac{1}{3}, \dfrac{1}{3}\right)$

Use the following for questions 7, 8 and 9.

Consider the points $P(1,-2,3)$, $Q(2,1,3)$ and $R(0,1,1)$.

1 mark 7. Find the vector that is equivalent to the directed line segment $\overrightarrow{PQ}$.

A: $(1,3,0)$	B: $(3,-7,4)$	C: $(1,2,-3)$	D: $(4,-5,1)$	E: $(4,0,-3)$

1 mark 8. Which one of the following vectors is parallel to the line through the points Q and R?

A: $(1,0,4)$	B: $(1,0,1)$	C: $(1,3,0)$	D: $(1,2,1)$	E: $(2,2,4)$

1 mark 9. Find the area of the triangle with vertices P, Q and R.

A: $\frac{1}{2}$	B: $\frac{3}{2}$	C: $\frac{5}{2}$	D: $\frac{\sqrt{13}}{2}$	E: $\frac{\sqrt{76}}{2}$

1 mark 10. Find the area of the parallelogram determined by the vectors $\mathbf{j}$ and $\mathbf{k}$.

A: 0	B: $\frac{1}{\sqrt{2}}$	C: $\sqrt{2}$	D: $\frac{1}{2}$	E: 1

1 mark 11. Which one of the following vectors is a normal for any line parallel to the line $4x-3y=-1$?

A: $(1,3)$	B: $(3,4)$	C: $(4,-3)$	D: $(1,1)$	E: $(-1,-1)$

1 mark 12. Which one of the following vectors is a normal for any line perpendicular to the line $4x-3y=1$?

A: $(1,3)$	B: $(3,4)$	C: $(4,-3)$	D: $(1,1)$	E: $(-1,-1)$

1 mark 13. Consider the lines ℓ_1 and ℓ_2 with parametric equations shown below.

$$\ell_1: \begin{aligned} x &= 1+t \\ y &= -4-t \end{aligned} \qquad \text{and} \qquad \ell_2: \begin{aligned} x &= 5-2s \\ y &= 3+3s \end{aligned}$$

If (a, b) is the point of intersection of lines ℓ_1 and ℓ_2, find the value of b.

A: -30	B: -3	C: 2	D: 3	E: 27

1 mark 14. Which one of the following is an equation of the line through the point $(1, 2, 0)$ which is perpendicular to both of the vectors $\mathbf{i}$ and $\mathbf{j}$?

A: $(x, y, z) = (0, 0, -1) + t(1, 2, 0)$	B: $(x, y, z) = (1, 2, 0) + t(1, 0, 0)$
C: $(x, y, z) = (1, 2, 0) + t(0, 1, 0)$	D: $(x, y, z) = (1, 2, 0) + t(1, -1, 0)$
E: $(x, y, z) = (1, 2, 0) + t(0, 0, -1)$	

1 mark 15. Which one of the following is an equation of the line through the point $(4, -1, 5)$ which is parallel to the line $(x, y, z) = (5, 2, -1) + s(0, -1, 3)$?

A: $(x, y, z) = (0, -1, 3) + t(4, -1, 5)$	B: $(x, y, z) = (4, -1, 5) + t(0, 1, -3)$
C: $(x, y, z) = (4, -1, 5) + t(0, 3, 1)$	D: $(x, y, z) = (4, -1, 5) + t(0, -1, -3)$
E: $(x, y, z) = (4, -1, 5) + t(4, 0, 2)$	

1 mark 16. Consider the line $(x, y, z) = (1 - t)(1, 2, -3) + t(3, -7, 4)$. Which one of the following vectors is perpendicular to this line?

A: $(0, 7, 9)$	B: $(-4, 0, 3)$	C: $(0, 3, 2)$	D: $(0, 4, 7)$	E: $(1, -1, 1)$

1 mark 17. Which one of the following points lies on the plane $3x - y + z = -6$?

A: $(1, 2, -1)$	B: $(1, 7, 1)$	C: $(0, -8, 2)$	D: $(2, 14, 2)$	E: $(0, 3, 3)$

1 mark 18. Consider the planes $3x + (1 + k)y + z = 5$ and $9x + 2ky + 3z = 4$. For what value of k are these planes parallel?

A: -2	B: 2	C: -3	D: 3	E: 1

PART B (7 marks)

YOU MUST SHOW YOUR WORK FOR ALL QUESTIONS IN PART B.

3 marks 19. Let ℓ be the line with point-parallel form equation $(x, y, z) = (1, 0, 1) + t(2, -1, 1)$ and let π be the plane through point $R(1, 3, 1)$ with normal vector $\mathbf{n} = (1, 2, 3)$. Find the point of intersection of line ℓ with plane π.
Show your work.

Answer: _____

2 marks 20. Find the distance from the point $(2, -3, 1)$ to the plane $x + y - z = 4$.
Show your work.

Answer: _____

2 marks 21. Find the volume of the parallelepiped determined by the vectors $\mathbf{u} = (0, -2, 1)$, $\mathbf{v} = (1, 2, -1)$ and $\mathbf{w} = \left(-\frac{1}{2}, -\frac{3}{2}, -\frac{5}{2}\right)$.

Answer: _____

Instructor's Name (**Print**)

Student's Name (**Print**)

Student's Signature

THE UNIVERSITY OF WESTERN ONTARIO
LONDON CANADA
DEPARTMENT OF MATHEMATICS

Mathematics 1229A Test 1

Friday, October 12, 2012 **Code 111** 7:00 p.m. - 8:30 p.m.

INSTRUCTIONS

1. Fill in the tops of this page **and the back of this page** completely. Be sure to print your name **legibly**.
2. Fill in the top of the scantron card completely. **Both print AND code** your Student Number, Section Number (see below) and Exam Code (shown above).
3. CALCULATORS AND NOTES ARE NOT PERMITTED.
4. DO NOT UNSTAPLE THE BOOKLET.
5. There are two parts to this examination: PART A (18 marks) in multiple choice format and PART B (7 marks) in written answer format.
6. In Part A, **circle** the correct answer to each question **on this paper** AND fill in the appropriate box on the **scantron** card with an HB pencil. This question paper will be returned to you.
7. In Part B, write your answer in the space provided.
8. Questions are printed on both sides of the paper. They begin on Page 1 and continue to Page 5. Be sure that your booklet is complete.
9. You must hand in this question paper, your scantron card, and all rough work sheets.
10. Circle your section in the list below.

Instructor	Campus/College	Time	Section
Combariza	Main	9:30 MWF	001
Nguyen	Main	12:30 MWF	002
Olds	Main	1:30 MWTh	003
Kossovskiy	Main	7:00 Tu	004
Florence	Brescia	9:30 MWTh	530
Pourkia	Huron	10:30 TuThF	550
Pourkia	Huron	8:30 MWF	551
Kuzmin	King's	1:30 TTh	570
Valluri	King's	9:30 TTh	571
Pourkia	King's	7:00 MW	572

11. TOTAL MARKS = 25.

Student Number (**Print**)

Student's Name (**Print**)

FOR GRADING ONLY

PAGE	MARK
1–3	
4	
5	
TOTAL	