Name: ______________________

Student ID: ______________________

CARLETON UNIVERSITY
DEPARTMENT OF MATHEMATICS & STATISTICS

MATH 2004-C (Fall 2018)
Test 1 (Tuesday, September 17, 2019)

Time: 50 minutes (no cellphones, notes, books, talking). Use the back of the paper how your work for long answer questions.

ЛARKS

(1) 1. Which of the following vectors is perpendicular to $\mathbf{v} = (-1, -1, 2)$?

(a) $(1, -1, 1)$ (b) $(1, -3, -1)$ (c) $(-1, 3, -2)$

(1) 2. A vector $\mathbf{v} \in \mathbb{R}^3$ is given as $v = |v|\left(\cos(\frac{\pi}{2}), \cos(\theta), \cos(\frac{\pi}{6})\right)$. What is θ?

(a) $\frac{1}{2}$ (b) 0 (c) $\frac{\pi}{3}$

(1) 3. Let $\mathbf{v}$ and $\mathbf{u}$ be two vectors in $\mathbb{R}^3$. Then the cross product $\mathbf{v} \times \mathbf{u}$ is

(a) perpendicular to both $\mathbf{v}$ and $\mathbf{u}$
(b) parallel to both $\mathbf{v}$ and $\mathbf{u}$
(c) Non of the above necessarily.

(1) 4. Which of the following lines is parallel to the vector $\mathbf{v} = (1, 2)$?

(a) $y = 2x - 5$ (b) $y = \frac{1}{2}x + 3$ (c) $y = -\frac{1}{2}x - 2$

(1) 5. Which of the following lines is perpendicular to the plane $-2x - y + 3z = 7$? (t represents a parameter)

(a)
$x = -2 + t$
$y = -1 + t$
$z = 3 + t$

(b)
$x = 1 - 2t$
$y = 1 - t$
$z = 2 + 3t$

(c)
$x = -1 + 2t$
$y = 3 + t$
$z = -2 + 3t$

(4) 6. Write the equation of a line going through the origin and perpendicular to the plane $3x - 2y = z - 7$.

$x = 3t$
$y = -2t$
$z = -t$

(4) 7. Consider planes $S : 2x - y + z$ and $S' : x - 2y + 3z = 0$. Find the angle between S and S' and their intersection.

$\begin{cases} 2x - y + z = 0 \\ x - 2y + 3z = 0 \end{cases}$ $-2\times$ $\Rightarrow 3y - 5z = 0 \Rightarrow z = \frac{3}{5}y$

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$\Rightarrow x = 2y - 3z = 2y - \frac{9}{5}y = \frac{1}{5}y$

$\Rightarrow \begin{cases} x = \frac{1}{5}t \\ y = t \\ z = \frac{3}{5}t \end{cases}$

$\cos\theta_0 = \frac{\vec{n}_1 \cdot \vec{n}_2}{|\vec{n}_1||\vec{n}_2|} = \frac{7}{\sqrt{6} \times \sqrt{14}} \Rightarrow \theta = \cos^{-1}\frac{7}{\sqrt{6 \times 14}}$

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