

Date: October 7, 2020

Name: _____

Instructor: Patricia Wrean

Math 251 Test 1

Total = $\overline{25}$

- **Show your work.** All of the work on this test must be your own. While writing this test, you may not consult any other person, website, or other resource not listed below. If you have a question during the test, you may email me.
- Here is a list of the resources that you are allowed to use during this test:

*in Fall 2020,
this course
was fully
online with
online tests*

- ~~– your own notes~~
- ~~– lecture notes, videos, handouts, practice questions, and practice tests from either my website at <http://wrean.ca/math251> or the Math 251 websites of any of the other instructors linked on the landing page of my site~~
- ~~– your textbook (Poole), or any of the texts listed on the Textbook page at http://wrean.ca/math251/math251_textbook.htm~~
- ~~– the Math 251 D2L website~~
- ~~– the Math 251 WeBWork online homework site~~
- ~~– a scientific calculator. You may not use a calculator with graphing capability. If you like, you may use a scientific calculator app like the one at Desmos: <https://www.desmos.com/scientific>~~
- ~~– if you have questions during the test, you may email me~~

*in Fall 2021,
we will
have
in-person
test with
different
rules*

- To submit this test, please use the Dropbox feature in the Assignments tab of D2L. Please assemble your answers into a single PDF or Word document, unless you've made other arrangements with me beforehand. Helpful software:
 - Genius Scan app at <https://www.thegrizzlylabs.com/genius-scan/>
 - CombinePDF at <https://combinepdf.com/>

GOOD LUCK!

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1. (5 points) Consider the two points $P = (2, 0, 1)$ and $Q = (1, 2, 2)$.
- (a) Write the equation of the line joining these two points. Write your answer in parametric form.
- (b) Find the angle $0 \leq \theta \leq 180^\circ$ between the vector \overrightarrow{QP} and the positive z -axis. Round your answer to the nearest degree.

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2. (6 points) The parallelogram $ABCD$ has vertices at $A = (1, 4, -3)$, $B = (-3, 1, -2)$, and $C = (-1, 5, 0)$. The convention is that the points are named in order as you go around the perimeter of the geometric figure. So point A is connected to points B and D.
- (a) Is this parallelogram a rhombus? Explain briefly. (A rhombus is a parallelogram whose sides all have the same length.)
- (b) Calculate the area of this parallelogram.

3. (5 points) Use Gauss-Jordan elimination to find all solutions of the following linear system. Write your answer in column vector form.

$$\begin{cases} x_1 + 3x_2 - x_3 - 9x_4 = 7 \\ 3x_1 + 9x_2 + x_3 - 11x_4 = 5 \\ -2x_1 - 6x_2 + 1x_3 + 14x_4 = -10 \end{cases}$$

4. (4 points) Find all unit vectors that are perpendicular to the following plane.

$$\begin{cases} x = 7 - 2s \\ y = 3s + 2t \\ z = -1 - 5s - 3t \end{cases}$$

5. (5 points) Consider the line through point P with direction vector \mathbf{d} , where P and \mathbf{d} are given below.

$$P = (3, 0, -1), \quad \mathbf{d} = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}.$$

Calculate the distance from this line to the point $Q = (-1, 2, 3)$.