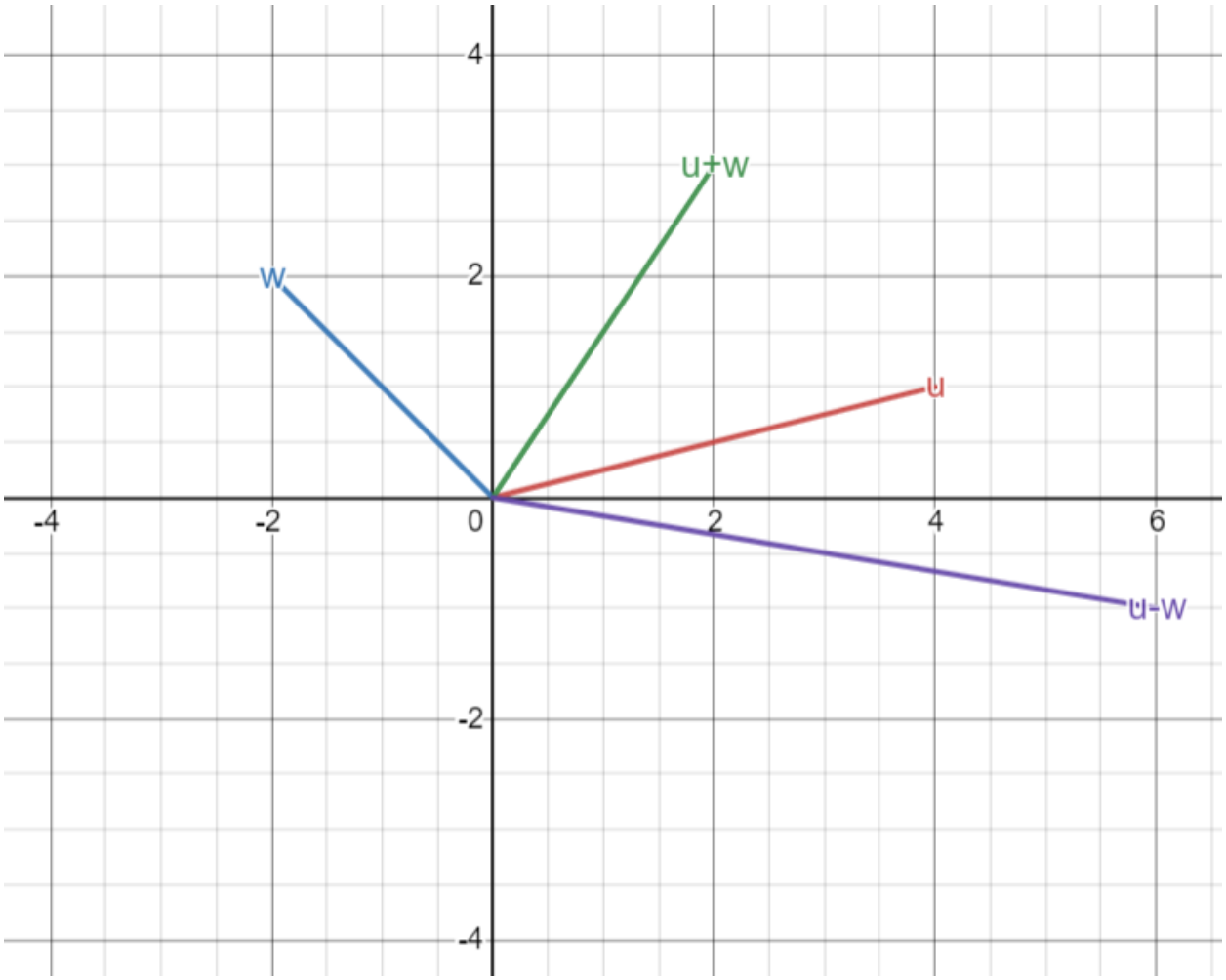
Aughdon Breslin, MA232 HW1, Prof. Sklinos, Due: 7/15/2021

Problem 1 [20pts] Draw u = [4,1], w = [−2,2] and (u + w), (u − w) in the plane.

u = [4, 1]
w = [-2, 2]
u+w = [4+(-2), 1+2]
= [2, 3]
u-w = [4-(-2), 1-2]
= [6, -1]



Aughdon Breslin, MA232 HW1, Prof. Sklinos, Due: 7/15/2021

Problem 2 [20pts] Find vectors u and w such that u + w = [4, 5, 6] and u − w = [2, 5, 8].

u+w + u−w = [4,5,6] + [2,5,8]
2u = [6,10,14]
u = [3,5,7]

u + w = [4,5,6]
[3,5,7] + w = [4,5,6]
w = [4,5,6] - [3,5,7]
w = [1,0,-1]

u = [3,5,7]
w = [1,0,-1]

Aughdon Breslin, MA232 HW1, Prof. Sklinos, Due: 7/15/2021

Problem 3 [20pts] Find two vectors u and w which are perpendicular to [1, 0, 1] and to each other.

let z = [1, 0, 1]
check u*z = 0
  let u = [0, 1, 0]
let w = u × z
check w*z = 0
check u*w = 0

u*z = u1*z1 + u2*z2 + u3*z3 = 0
  u1*1 + u2*0 + u3*1 = 0
  let u1 = 0, u2 = 1, u3 = 0
  0*1 + 1*0 + 0*1 = 0+0+0 = 0 GOOD
u = [0, 1, 0]

w = u × z = [u2*z3 - u3*z2, u3*z1 - u1*z3, u1*z2 - u2*z1]
  = [1*1-0*0, 0*1-0*1, 0*0-1*1]
w = [1, 0, -1]

w*z = w1*z1 + w2*z2 + w3*z3 = 0
  1*1 + 0*0 + (-1)*1 = 0 GOOD

u*w = u1*w1 + u2*w2 + u3*w3 = 0
  0*1 + 1*0 + 0*(-1) = 0 GOOD

u = [0, 1, 0] and w = [1, 0, -1]

Aughdon Breslin, MA232 HW1, Prof. Sklinos, Due: 7/15/2021

Problem 4 [20pts] How long is the vector u = [1, 1, 1, 1, 1]?

$||u|| = \sqrt{(1^2+1^2+1^2+1^2+1^2)} = \sqrt{5}$

$||u|| = \sqrt{5}$

Aughdon Breslin, MA232 HW1, Prof. Sklinos, Due: 7/15/2021

Problem 5 [20 pts] Consider the following system of equations:
2x + 3y + z = 8
4x + 7y + 5z = 20
−2y + 2z = 0
Apply Gauss Elimination in order to solve it.

2x + 3y + z = 8
4x + 7y + 5z = 20
−2y + 2z = 0

-> second = second - 2*first ->

2x + 3y + z = 8 -> 2x + 3y + z = 8
(4x-4x + 7y-6y + 5z-2z = 20-16) -> y + 3z = 4
−2y + 2z = 0 -> divide by 2 to simplify -> -y + z = 0

-> third = third + second ->

2x + 3y + z = 8 -> 2x + 3y + z = 8
y + 3z = 4 -> y + 3z = 4
(-y+y + z+3z = 0+4) -> 4z = 4

4z = 4 -> z = 1
y + 3(1) = 4 -> y = 4-3 -> y = 1
2x + 3(1) + (1) = 8 -> 2x + 4 = 8 -> 2x = 4 -> x = 2

x = 2, y = 1, and z = 1