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MATH 4610
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Tasksheet 9

Task 1
- Vector Addition.
- Vector Subtraction.
- Scalar Multiplication for Vectors.
- Vector Dot Product.
- Outer Product.

Task 2
- Vector 1-Norm.
- Vector 2-Norm.
- Vector Infinity-Norm.
- Vector Difference 1-Norm.
- Vector Difference 2-Norm.
- Vector Difference Infinity-Norm.

Task 3
- Matrix Addition.
- Matrix Subtraction.
- Scalar Multiplication for Matrices.
- Matrix Transpose.
- Dot Product of a Matrix and a Vector.
- Matrix Dot Product.

Task 4 Jacobi Iteration

Task 5 In my software manual entry, I test Jacobi iteration on a 100×100 diagonally dominant matrix. I can do the same use Gaussian elimination:

```
1  from solve import solve
2  from more_matgen import diag_dom
3  from matrix_ops import mat_vec_prod
4
5
6  A = diag_dom(100)
7  x = [1 for i in range(100)]
8  b = mat_vec_prod(A, x)
9  sol_1 = solve(A, b)
10 print(sol_1)
```

This is the solution vector I get

```
[1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
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 1. 1. 1. 1.]
```

Therefore, Jacobi iteration does a good job at approximating this.

Task 6 According to [1], the main difference in Gauss-Seidel is it uses updated values when possible instead of always relying on iterated values. Besides that one point, the two methods have a very similar approach.

References

[1] https://www.sciencedirect.com/topics/engineering/gauss-seidel-method