Make sure you justify your statements completely and carefully.

1. Problem 5.1.3 from the **Notes**.
(HINT: The thing to realize initially is that, for a given $\mathbf{c}$, we can have both $\mathbf{c} = \mathbf{ev}_{\alpha,v}(f(x)) \in GRS_{n,k}(\boldsymbol{\alpha}, \mathbf{v})$ and $\mathbf{c} = \mathbf{ev}_{\beta,w}(g(x)) \in GRS_{n,k}(\boldsymbol{\beta}, \mathbf{w})$ for different polynomials $f(x)$ and $g(x)$.)

2. Problem A.2.26 from the Appendix 2 of the **Notes**. Prove *first* that

$$(a(x) + b(x))' = a'(x) + b'(x)\,.$$

3. Problem 5.1.5 from the **Notes**. In parts (b) and (c) you may assume, for a finite field F with $|F| = q$, that the set of all elements of F is precisely the set of roots of the polynomial $x^q - x$ and, hence, that the nonzero elements of F are precisely the roots of the polynomial $x^{q-1} - 1$. (We will prove this later in the course.)

4. Let C and D be linear codes over the field F with $C = D^\perp$. Let PC be the code C punctured at its last coordinate position, and let SD be the code D shortened at its last coordinate position. Prove that $PC = SD^\perp$.

REMARK. The code PC is constructed by deleting the last coordinate position from all codewords of C. The code SD is constructed by first selecting only those codewords of D that end in 0, and then deleting from these that final 0 position.

For the final two problems, 'justifying your statements completely and carefully' means you should show your calculations in enough detail that I can follow them (and can try to locate any mistakes). ***Please do not do your calculations on a machine.*** *As these two problems are largely computational, I ask that you not collaborate on them.*

5. Problem 5.2.5 from the **Notes**.

6. Consider the code $GRS_{10,4}(\boldsymbol{\alpha}, \mathbf{v})$ over $\mathbb{F}_{11}$ that was our classroom example.
(a) Use Euclidean Algorithm decoding to decode the received vector

$$(0, 5, 9, 0, 1, 4, 5, 0, 6, 0)\,.$$

(b) Use Euclidean Algorithm decoding to decode the received vector

$$(1, 1, 1, 1, 0, 0, 0, 0, 0, 0)\,.$$