A2 - Proofs - Q1

1. Show that $m(a+bX) = a + b \times M(X)$

- We know that $m(X) = 1/n \sum_{i=1}^{N} x_i$
  - so $m(a+bx) = 1/n \sum_{i=1}^{N} (a + bx)$
- $1/n \sum_{i=1}^{N} a + 1/N \sum_{i=1}^{N} bx$
- $a + b \cdot (1/N \sum_{i=1}^{N} x) = a + b \cdot M(x)$

2. $\mathrm{cov}(X, a+bY) = b \cdot \mathrm{cov}(X, Y)$

- We know that $\mathrm{cov}(X,Y) = 1/N \sum_{i=1}^{N} (x_i - M(x))(y-M$

- $\mathrm{cov}(X, a+BY) = 1/N \sum_{i=1}^{N} (x_i - M(x))(a+by_i) - m($
- We know that $m(a+bY) = a + b \cdot M(y)$ from #
- so $\frac{1}{N} \sum_{i=1}^{N} (x_i - M(x))(by_i - bM(y))$
- and $\frac{1}{N} \sum_{i=1}^{N} (x_i - M(x)) b(y_i - M(y))$
- which is $b \times \mathrm{cov}(X, Y)$

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