CS 4641 Background Test Answers

1 Probability and Statistics 1

1. C
2. $a^2 Var[X]$
3. $\frac{1}{n}\sum_{i=1}^{n}(X_i - \bar{X}_n)^2$ or $\frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X}_n)^2$ where $\bar{X}_n = \frac{1}{n}\sum_{i=1}^{n} X_i$.
4. C
5. $$f(x) = \begin{cases} 1 & if \quad 0 \leq x \leq 1 \\ 0 & otherwise \end{cases}$$
6. C
7. D
8. $\frac{5}{36}$
9. TRUE
10. $1 - (1 - p^n)^m$

2 Probability and Statistics 2

1. C
2. C
3. TRUE
4. (1) 0; (2) $\beta_0 + \beta_1 x$
5. TRUE
6. B
7. FALSE
8. A
9. C
10. A

3 Linear Algebra

1. $m \times d$; $C_{ij} = \sum_{k=1}^{n} A_{ik} B_{kj}$
2. False
3. False
4. A
5. B, C, E
6. A
7. 2, 2
8. B, C, D
9. C
10. $\nabla f(x) = a$, $\nabla g(x) = 2(a^\top x)a$ (equivalent solution: $2(x^\top a)a$, $\nabla g(x) = 2aa^\top x$)

4 Numpy

1. arange(32, 76, 2)
2. a = sqrt(x)
3. x = x ** y or power(x, y)
4. a = A[0] or a = A[0, :]
5. x[x > 0] = 0 or where(x > 0, 0, x)
6. A, B, C, D
7. array([[7, 28], [14, 35], [21, 42]])
8. array([[9, 16, 21],[24, 25, 24]])
9. array([True, False, True, True, False])
10. a = sum(x) or a = x.sum()