Math3_Statistics_LinearAlgebra.pdf

Page 1 – Statistics (I)

1. Define mean

2. Find mean of [6, 8, 10, 12, 14]

3. Median of [3, 8, 11, 13, 18]

4. Variance formula

5. Standard deviation of [4, 8, 12, 16, 20]

6. Outlier definition

7. Interquartile range of [2,4,6,8,10,12]

8. What is a box plot?

9. Probability: roll two dice, both sixes

10. What is a frequency table?

Page 2 – Statistics (II)

1. Mode of [4, 6, 6, 8, 10, 10, 10]

2. What is correlation?

3. Scatter plot explanation

4. What is a z-score?

5. Permutations: 4 letters in "STOP"

6. Combinations: choose 2 from 7

7. Event A: $P(A)=0.4$, B: $P(B)=0.5$, $P(A \cap B)=0.2$. $P(A \cup B)=$?

8. Probability: pick red from 3 red, 5 blue balls

9. Histogram vs. bar chart

10. Probability: flip 2 coins, both heads

Page 3 – Statistics (III)

1. Quartiles in [1,2,3,4,5,6,7,8,9]

2. Find the mode in [7, 8, 9, 8, 8, 10, 9]

3. Variance of [2,2,4,6,6,6,7]

4. Probability: get a king from a deck

5. What is the mean absolute deviation?

6. Frequency polygon explanation

7. What is a stem-and-leaf plot?

8. Probability: 5 marbles, 2 green. Probability of green?

9. Median in [10, 20, 30, 40, 50, 60, 70]

10. What is a uniform distribution?

Page 4 – Statistics (IV)

1. Range of [1,4,7,12,15]

2. Probability: Drawing an ace from 52 cards

3. What is normal distribution?

4. Probability: toss 3 coins, 2 heads

5. What is sample space?

6. Expected value definition

7. Binomial probability formula

8. Cumulative frequency explanation

9. Probability: Roll die, even number

10. What is a random sample?

Page 5 – Linear Algebra (I)

1. Define a matrix

2. Multiply: [[1,0],[2,1]] × [[2,2],[1,3]]

3. Find the determinant: [[5,7],[2,4]]

4. What is a vector?

5. Add vectors: [2,3] + [1,4]

6. Scalar multiplication of matrix

7. If v = [1,2], w = [3,1], dot product?

8. What is a square matrix?

9. Identity matrix explanation

10. Find eigenvalues of [[3,0],[0,2]]

Page 6 – Linear Algebra (II)

1. Find the inverse of [[2,1],[1,1]]

2. What is a diagonal matrix?

3. What is matrix transpose?

4. Trace of [[3,2],[4,1]]

5. What is a basis?

6. Null space definition

7. Symmetric matrix explanation

8. Solve Ax = b for x: A = [[1,3],[2,4]], b = [5,10]

9. Orthogonality definition

10. What is a row-reduced echelon form?

Page 7 – Calculus (I)

1. Evaluate the derivative of $y = 3e^x$

2. Integrate $\int 2x\, dx$

3. Differentiate $f(x) = x^2 + 5x$

4. $\lim(x \to 0)\ (1-\cos(x))/x^2$

5. Find the critical points of $f(x) = x^3 - 2x$

6. Integrate $\int 1/(1 + x^2)\, dx$

7. Area under $y = 4x$, x=1 to x=5

8. Second derivative of $y = x^4$

9. What is the limit as $x \to \infty$ of $1/x$?

10. Find the inflection points of $f(x) = x^4 - 8x^2 + 7$

Page 8 – Calculus (II)

1. Differentiate $y = \sin(2x)$

2. Integrate $\int x \cos(x)\, dx$

3. What is a Riemann sum?

4. $\lim(x \to 1)\ (x^2 - 1)/(x - 1)$

5. Maximum of $f(x) = -x^2 + 2x + 3$

6. Find dy/dx for $y = \ln(x^2)$

7. Taylor expansion of $\ln(1+x)$ at $x = 0$

8. What is the Mean Value Theorem?

9. Integrate $\int e^x \, dx$

10. Chain rule: $d/dx \, [\cos(x^2)]$

Page 9 – Calculus (III)

1. Differentiate $y = 3x^2 + 2x + 5$

2. Find area between $y = x$ and $y = x^2$, $x = 0$ to $x = 1$

3. What is an antiderivative?

4. Integrate $\int(x^2 + 2x + 1) \, dx$

5. $\lim(x\to\infty) \, (x^2 + 2x)/(x^2 + 4x)$

6. Find the slope of tangent to $y = x^2$ at $x = -1$

7. What is a local maximum?

8. Second derivative of $y = \cos(x)$

9. Find inflection point of $y = x^3 - 3x$

10. Integrate $\int \sin(x) \, dx$

Page 10 – Word Problems

1. Rectangle area 30, width 5. Find length.

2. 9 pencils cost $2. How much for 15?

3. Ball thrown upward at 8 m/s, height after 1s?

4. If $f(x) = x^2 + 3$, what is $f(4)$?

5. Two numbers add to 50, one is 20. Other?

6. 5 tickets, $12 for adults, $8 for kids. Total $44. How many adults?

7. Solve: $x + 2y = 14$, $3x - y = 7$

8. Circle area 50.24. What is the radius? ($\pi=3.14$)

9. If $x/4 = 5$, $x = $?

10. A car travels at 70 mph for 2.5 hours. How far?