Faculty Applied Computer Science

Example Admission Test B.Sc. Artificial Intelligence

Calculus

Question 1

Given the function f(x) = $(e^x)/(e^x-2)$, what is f'(x)?

☒ $f'(x)= (-2e^x)/(e^x-2)^2$

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☐ $f'(x)= (-2e^x)/(e^x+2)^2$

Question 2

Given the function $f(x)=29x^3+8x^2-12x+22$

What is the slope at point x = 0?

☐ -22

☒ -12

☐ 12

☐ 22

Question 3

What is the derivative of the function $f(x)=sin(2x)-cos(x)$?

☐ f'(x) = - cos(x) + sin(x)

☐ f'(x) = cos(2x) - sin(x)

☐ f'(x) = - 2sin(x) + cos(x)

☒ f'(x) = 2 cos(2x) + sin(x)

Question 4

For $f(x)=cos(2*x)+e^x+x^2$, what is $f'(x)$?

☐ $4cos(2*x)+2$

☐ $4*sin(x)+e^x+2$

☒ $-4*cos(2*x)+e^x+2$

☐ $-4*cos(x)+2*e^x$

Foundations of Computer Science

Question 5

Given is the following algorithm:

```
Method trib(n)
   If n = 1 or n = 2
      return 0
   Else If n = 3
      return 1
   Else
      return trib(n-1) + trib(n-2) + trib(n-3)
EndMethod
```

What is trib(4)?

☒ 1

☐ 4

☐ 0

☐ 3

Question 6

A balanced binary tree contains 250 elements. What is the maximum number of comparisons necessary to find an element in the tree?

☐ 250

☐ 1

☒ 8

☐ 25

Question 7

Given the following class for a staff management software:

Employer, attributes pid, name, working time, Methods: add working time

What are suitable data types to the attribute pid? (Several possible)

☐ float

☒ Int

☒ String

☐ blob

Question 8

How can you devise an algorithm that determines for any possible Java program input whether the program raises a NullPointerException?

☒ Such an algorithm can not exist

☐ Build a sophisticated parser for the grammar of Java

☐ Run topological sorting on the input

☐ Use machine learning to learn from labeled program inputs

Linear Algebra

Question 9

Given the planes A1: $4x-2y+z=7$ and A2: $x+by-3z=2$.

Calculate b so that A1 and A2 are perpendicular.

☒ ½

☐ 0

☐ 1/3

☐ 1

Question 10

Points A (1 | 1 | 1) , B (0 | 2 | 2), and C (- 1 | 2 | 0) define the plane P. What is the equation of the plane P in point-normal form using A as position vector?

☐ $2x_1-3x_2-x_3+4=0$

☐ $-2x_1-9x_2+x_3+4=0$

☒ $-2x_1-3x_2+x_3+4=0$

☐ $2x_1-9x_2-x_3+4=0$

Question 11

A man takes a walk with 2 dogs. The angle between the dog leads is 50 degrees. To which angle (approximately) does the man move when one dog has double the power than the other?

☐ 14.2 °

☐ 14 °

☐ 0 °

☒ 13.1 °

Question 12

Find the magnitude of vector v = <-3,−2>

☒ sqrt(13)

☐ 5

☐ 13

☐ sqrt(5)

Probabilities

Question 13

A spinning wheel consists of five equally sized sectors. One of the sectors is labeled "0", one is labeled "1", and one is labeled "2"; the other two sectors are labeled "9".

The wheel is spun four times. Calculate the probability that the numbers 2, 0, 1, and 9 appear in the specified order.

☐ 2/125

☐ 1/125

☒ 2/625

☐ 1/625

Question 14

An assembly line in a company has an error rate of 2% -- i.e. 2% of all produced components are faulty. Assume that the error rate of randomly selected components follows a binominal distribution. With 50 components selected randomly, what is the probability that at least 6% of the components are faulty?

☐ 12.3%

☐ 10.9%

☐ 8.9%

☒ 7.8%

Question 15

The company InfiChip produces RAM memory chips with the machines M1, M2 and M3. The machines participate in the full production with following portions: M1 40%, M2 50% and M3 10%. The error rate of M1 is 4%, M2 8% and M3 10%.

A arbitrary selected chip is erroneous. What is the probability that it was produced with machine M1?

☐ 0.6134

☒ 0.2424

☐ 0.3145

☐ 0.2525

Question 16

Calculate the corrected sample standard deviation for the following sequence 9, 2, 5, 4, 12, 7.

☐ 10.916...

☒ 3.619…

☐ 13.1

☐ 3.304...