PRMIA 8002

PRM Certification - Exam II: Mathematical Foundations of Risk Measurement

Version: 4.0

QUESTION NO: 1

For a quadratic equation, which of the following is FALSE?

A. If the discriminant is negative, there are no real solutions
B. If the discriminant is zero, there is only one solution
C. If the discriminant is negative there are two different real solutions
D. If the discriminant is positive there are two different real solutions

Answer: C
Explanation:

QUESTION NO: 2

The natural logarithm of x is:

A. the inverse function of exp(x)
B. log(e)
C. always greater than x, for x>0
D. 46

Answer: A
Explanation:

QUESTION NO: 3

When a number is written with a fraction as an exponent, such as , which of the following is the correct computation?

A. Take the square-root of 75 and raise it to the 5th power
B. Divide 75 by 2, then raise it to the 5th power
C. Multiply 75 by 2.5
D. Square 75, then take the fifth root of it

Answer: A
Explanation:

QUESTION NO: 4

You invest $2m in a bank savings account with a constant interest rate of 5% p.a. What is the value of the investment in 2 years time if interest is compounded quarterly?

A. $2,208,972
B. $2,210,342
C. $2.205,000
D. None of them

Answer: A
Explanation:

QUESTION NO: 5

Solve the simultaneous linear equations: x + 2y - 2 = 0 and y - 3x = 8

A. x = 1, y = 0.5
B. x = -2, y = 2
C. x = 2, y = 0
D. None of the above

Answer: B
Explanation:

QUESTION NO: 6

Find the roots, if they exist in the real numbers, of the quadratic equation

A. 4 and -2
B. -4 and 2
C. 1 and 0
D. No real roots

Answer: D
Explanation:

QUESTION NO: 7

The sum of the infinite series 1+1/2+1/3+1/4+1/5+.... equals:

A. 12
B. Infinity
C. 128
D. 20

Answer: B
Explanation:

QUESTION NO: 8

Which of the following properties is exhibited by multiplication, but not by addition?

A. associativity
B. commutativity
C. distributivity
D. invertibility

Answer: C
Explanation:

QUESTION NO: 9

Identify the type and common element (that is, common ratio or common difference) of the following sequence: 6, 12, 24

A. arithmetic sequence, common difference 2
B. arithmetic sequence, common ratio 2
C. geometric sequence, common ratio 2
D. geometric sequence, common ratio 3

Answer: C
Explanation:

QUESTION NO: 10

What is the sum of the first 20 terms of this sequence: 3, 5, 9, 17, 33, 65,…?

A. 1 048 574

B. 1 048 595
C. 2 097 170
D. 2 097 172

Answer: C
Explanation:

QUESTION NO: 11

What is the simplest form of this expression: log2(165/2)

A. 10
B. 32
C. 5/2 + log2(16)
D. log2 (5/2) + log2(16)

Answer: A
Explanation:

QUESTION NO: 12

For each of the following functions, indicate whether its graph is concave or convex:

Y = 7x2 + 3x + 9

Y = 6 ln(3x)

Y = exp(-4x)

A. concave, concave, concave
B. concave, convex, convex
C. convex, concave, concave
D. convex, convex, concave

Answer: C
Explanation:

QUESTION NO: 13

You invest $100 000 for 3 years at a continuously compounded rate of 3%. At the end of 3 years, you redeem the investment. Taxes of 22% are applied at the time of redemption. What is your approximate after-tax profit from the investment, rounded to $10?

A. $9420
B. $7350
C. $7230
D. $7100

Answer: B
Explanation:

QUESTION NO: 14

Which of the provided answers solves this system of equations?

2y – 3x = 3y +x

y2 + x2 = 68

A. x = 1; y = square root of 67
B. x = 2; y = 8
C. x = 2; y = -8
D. x = -2; y = -8

Answer: C
Explanation:

QUESTION NO: 15

You intend to invest $100 000 for five years. Four different interest payment options are available. Choose the interest option that yields the highest return over the five year period.

A. a lump-sum payment of $22 500 on maturity (in five years)
B. an annually compounded rate of 4.15%
C. a quarterly-compounded rate of 4.1%
D. a continuously-compounded rate of 4%

Answer: C
Explanation:

QUESTION NO: 16

What is the 40th term in the following series: 4, 14, 30, 52, …?

A. 240
B. 4598
C. 4840
D. 4960

Answer: C
Explanation:

QUESTION NO: 17

Let a, b and c be real numbers. Which of the following statements is true?

A. The commutativity of multiplication is defined by
B. The existence of negatives is defined by
C. The distributivity of multiplication is defined by
D. The associativity of multiplication is defined by

Answer: C
Explanation:

QUESTION NO: 18

Which of the following is not a sequence?

A. , , , … , , …
B. , , , , …
C. , , , , , , …
D. 30

Answer: D
Explanation:

QUESTION NO: 19

Which of the following statements is not correct?

A. Every linear function is also a quadratic function.
B. A function is defined by its domain together with its action.
C. For finite and small domains, the action of a function may be specified by a list.
D. A function is a rule that assigns to every value x at least one value of y.

Answer: D
Explanation:

QUESTION NO: 20

Which of the following statements is true?

A. Discrete and continuous compounding produce the same results if the discount rate is positive.
B. Continuous compounding is the better method because it results in higher present values compared to discrete compounding.
C. Continuous compounding can be thought as making the compounding period infinitesimally small.
D. The constant plays an important role in the mathematical description of continuous compounding.

Answer: C
Explanation:

QUESTION NO: 21

Let X be a random variable normally distributed with zero mean and let . Then the correlation between X and Y is:

A. negative
B. zero
C. not defined

D. positive

Answer: B
Explanation:

QUESTION NO: 22

A typical leptokurtotic distribution can be described as a distribution that is relative to a normal distribution

A. peaked and thin at the center and with heavy (fat) tails
B. peaked and thin at the center and with thin tails
C. flat and thick at the center and with heavy (fat) tails
D. flat and thick at the center and with thin tails

Answer: A
Explanation:

QUESTION NO: 23

Kurtosis(X) is defined as the fourth centred moment of X, divided by the square of the variance of X. Assuming X is a normally distributed variable, what is Kurtosis(X)?

A. 0
B. 3
C. 2
D. 1

Answer: B
Explanation:

QUESTION NO: 24

Over four consecutive years fund X returns 1%, 5%, -3%, 8%. What is the average growth rate of fund X over this period?

A. 2.67%
B. 2.75%

C. 2.49%
D. None of the above

Answer: A
Explanation:

QUESTION NO: 25

The quarterly compounded rate of return is 6% per annum. What is the corresponding effective annual return?

A. 1.50%
B. 6%
C. 6.14%
D. None of the above

Answer: C
Explanation:

QUESTION NO: 26

If the annual volatility of returns is 25% what is the variance of the quarterly returns?

A. 0.1250
B. 0.0156
C. 0.0625
D. None of the above

Answer: B
Explanation:

QUESTION NO: 27

I have $5m to invest in two stocks: 75% of my capital is invested in stock 1 which has price 100 and the rest is invested in stock 2, which has price 125. If the price of stock 1 falls to 90 and the price of stock 2 rises to 150, what is the return on my portfolio?

A. -2.50%

B. -5%
C. 2.50%
D. 5%

Answer: A
Explanation:

QUESTION NO: 28

Suppose 60% of capital is invested in asset 1, with volatility 40% and the rest is invested in asset 2, with volatility 30%. If the two asset returns have a correlation of -0.5, what is the volatility of the portfolio?

A. 36%
B. 36.33%
C. 26.33%
D. 20.78%

Answer: D
Explanation:

QUESTION NO: 29

Which of the following statements concerning class intervals used for grouping of data is correct?

When grouping data, attention must be paid to the following with regards to class intervals:

1. Class intervals should not overlap

2. Class intervals should be of equal size unless there is a specific need to highlight data within a specific subgroup

3. The class intervals should be large enough so that they not obscure interesting variation within the group

A. Statements 2 and 3 are correct
B. Statements 1 and 2 are correct
C. All three statements are correct
D. Statements 1 and 3 are correct

Answer: B

Explanation:

QUESTION NO: 30

Consider an investment fund with the following annual return rates over 8 years: +6%, -6%, +12%, -12%, +3%, -3%, +9%, -9% .

What can you say about the annual geometric and arithmetic mean returns of this investment fund?

A. The arithmetic mean return is zero and the geometric mean return is negative
B. The arithmetic mean return is negative and the geometric mean return is zero
C. The arithmetic mean return is equal to the geometric mean return
D. None of the above

Answer: A

Explanation:

QUESTION NO: 31

Which of the following statements about variance and standard deviation are correct?

1. When calculated based on a sample of the population data, one has to correct for any bias in the result by using the number of degrees of freedom in the calculation

2. Variance is in square root units of the underlying data, whereas standard deviation is in units of the underlying data

3. When considering independent variables, variance is additive, while standard deviation is not

A. All three statements are correct
B. Statements 1 and 2 are correct
C. Statements 1 and 3 are correct
D. Statements 2 and 3 are correct

Answer: C

Explanation:

QUESTION NO: 32

Which of the following statements about skewness of an empirical probability distribution are correct?

1. When sampling returns from a time series of asset prices, discretely compounded returns exhibit higher skewness than continuously compounded returns

2. When the mean is significantly less than the median, this is an indication of negative skewness

3. Skewness is a sign of asymmetry in the dispersion of the data

A. All three statements are correct
B. Statements 1 and 2 are correct
C. Statements 1 and 3 are correct
D. Statements 2 and 3 are correct

Answer: A
Explanation:

QUESTION NO: 33

Consider two securities X and Y with the following 5 annual returns:

X: +10%, +3%, -2%, +3%, +5%

Y: +7%, -2%, +3%, -5%, +10%

In this case the sample covariance between the two time series can be calculated as:

A. 0.40729
B. 0.00109
C. 0.00087
D. 0.32583

Answer: B
Explanation:

QUESTION NO: 34

The first derivative of a function f(x) is zero at some point, the second derivative is also zero at this point. This means that:

A. f has necessarily a minimum at this point
B. f has necessarily a maximum at this point
C. f has necessarily neither a minimum nor a maximum at this point
D. f might have either a minimum or a maximum or neither of them at this point

Answer: D
Explanation:

QUESTION NO: 35

Find the first-order Taylor approximation p(x) for the function: at the point .

A. -x
B. -x+1
C. x-1
D. x+1

Answer: B
Explanation:

QUESTION NO: 36

At what point x does the function f(x) = x3 - 4x2 + 1 have a local minimum?

A. -0.666666667
B. 0
C. 2.66667
D. 2

Answer: C
Explanation:

QUESTION NO: 37

What is the maximum value for f(x)= 8-(x+3)(x-3)?

A. 8
B. -1
C. 17
D. None of these

Answer: C
Explanation:

QUESTION NO: 38

For the function f(x) =3x-x3 which of the following is true?

A. x = 0 is a minimum
B. x = -3 is a maximum
C. x = 2 is a maximum
D. None of these

Answer: D
Explanation:

QUESTION NO: 39

What is the maximum value of the function F(x, y)=x2+y2 in the domain defined by inequalities x 1, y -2, y-x 3 ?

A. 29
B. -25
C. 1
D. 17

Answer: A
Explanation:

QUESTION NO: 40

You work for a brokerage firm that charges its client x per share. The volume of trade of a client of type A depends on the per share commission in the following manner. If the commission is x, the client of type A will trade e-ax shares on average each week. What is the optimal commission x that maximizes the income from client A, noting that a is greater than zero?

A. 1
B. a
C. 42
D. a2

Answer: C
Explanation:

QUESTION NO: 41

An indefinite integral of a polynomial function is

A. always positive
B. always increasing
C. always less than the function itself
D. none of the above

Answer: D
Explanation:

QUESTION NO: 42

Evaluate the derivative of ln(1+ x2) at the point x = 1

A. 0.5
B. 0
C. 1
D. 2

Answer: C
Explanation:

QUESTION NO: 43

Evaluate the derivative of exp(x2 + 2x + 1) at the point x = -1

A. 0.5
B. 0
C. 1
D. 2

Answer: B
Explanation:

QUESTION NO: 44

A 2-year bond has a yield of 5% and an annual coupon of 5%. What is the Macaulay Duration of the bond?

A. 2
B. 1.95
C. 1.86
D. 1.75

Answer: B
Explanation:

QUESTION NO: 45

A 2-year bond has a yield of 5% and an annual coupon of 5%. What is the Modified Duration of the bond?

A. 2
B. 1.95
C. 1.86
D. 1.75

Answer: C
Explanation:

QUESTION NO: 46

A bond has modified duration 6 and convexity 30. Find the duration-convexity approximation to the percentage change in bond price when its yield increases by 5 basis points

A. 10 basis point rise
B. 24 basis fall
C. 24 basis point rise
D. 30 basis points fall.

Answer: D
Explanation:

QUESTION NO: 47

An underlying asset price is at 100, its annual volatility is 25% and the risk free interest rate is 5%. A European call option has a strike of 85 and a maturity of 40 days. Its Black-Scholes price is 15.52. The options sensitivities are: delta = 0.98; gamma = 0.006 and vega = 1.55. What is the delta-gamma-vega approximation to the new option price when the underlying asset price changes to 105 and the volatility changes to 28%?

A. 17.33
B. 18.75
C. 19.23
D. 20.54

Answer: D
Explanation:

QUESTION NO: 48

An underlying asset price is at 100, its annual volatility is 25% and the risk free interest rate is 5%. A European put option has a strike of 105 and a maturity of 90 days. Its Black-Scholes price is 7.11. The options sensitivities are: delta = -0.59; gamma = 0.03; vega = 19.29. Find the delta-gamma approximation to the new option price when the underlying asset price changes to 105

A. 6.49
B. 5.03
C. 4.59
D. 4.54

Answer: D
Explanation:

QUESTION NO: 49

You are given the following values of a quadratic function f(x): f(0)=0, f(1)=-2, f(2)=-5. On the basis of these data, the derivative f'(0) is …

A. in the interval]-2.5,-2[
B. equal to -2
C. in the interval]-2,+[
D. in the interval]-,-2.5]

Answer: C
Explanation:

QUESTION NO: 50

Suppose that f(x) and g(x,y) are functions. What is the partial derivative of f(g(x,y)) with respect to y?

A. f'(g(x,y))
B. f(dg/dy)
C. f(g(x,y)) dg/dy
D. f'(g(x,y)) dg/dy

Answer: D
Explanation:

QUESTION NO: 51

What is the total derivative of the function f(x,y) = ln(x+y), where ln() denotes the natural logarithmic function?

A. 1 / (x+y)
B. (x + y) / (x+y)
C. -x/(x+y) - y/(x+y)
D. ln(x+y) x + ln(x+y) y

Answer: B
Explanation:

QUESTION NO: 52

What is the indefinite integral of the function f(x) = ln(x), where ln(x) denotes the natural logarithmic function?

A. x ln(x) - x
B. ln(x) - x
C. 1/x
D. exp(x)

Answer: A
Explanation:

QUESTION NO: 53

The Lagrangian of a constrained optimisation problem is given by L(x,y,) = 16x+8x2+4y-(4x+y-20), where is the Lagrange multiplier. What is the solution for x and y?

A. x = -1, y = 0
B. x = 0, y = 20
C. x = 5, y = 0
D. None of the above

Answer: B
Explanation:

QUESTION NO: 54

Consider two functions f(x) and g(x) with indefinite integrals F(x) and G(x), respectively. The indefinite integral of the product f(x)g(x) is given by

A. F(x)G(x)
B. F(x)g(x) + f(x)G(x)
C. F(x)g(x) - F(x)g'(x)dx
D. f(x)G(x) - F(x)g'(x)dx

Answer: C
Explanation:

QUESTION NO: 55

The fundamental theorem of analysis establishes a relation between

A. First and second derivative of a function
B. The derivative of a function and the slope of its graph
C. Integration and differentiation of functions
D. The derivative of a function and the derivative of its inverse function

Answer: C
Explanation:

QUESTION NO: 56

Bond convexity is closely related to …

A. The derivative of the bond's present value with respect to yield
B. The second derivative of the bond's present value with respect to yield
C. The integral of the bond's present value with respect to yield
D. The sensitivity of the bond's present value with respect to yield

Answer: B
Explanation:

QUESTION NO: 57

In a quadratic Taylor approximation, a function is approximated by:

A. a constant
B. a straight line

C. a parabola
D. a cubic polynomial

Answer: C
Explanation:

QUESTION NO: 58

Which statement regarding the matrix below is true?

A. It is not positive definite
B. It is positive semi-definite
C. It is positive definite
D. It is negative definite

Answer: A
Explanation:

QUESTION NO: 59

Every covariance matrix must be positive semi-definite. If it were not then:

A. Some portfolios could have a negative variance
B. One or more of its eigenvalues would be negative
C. There would be no Cholesky decomposition matrix
D. All the above statements are true

Answer: D
Explanation:

QUESTION NO: 60

The determinant of a matrix X is equal 2. Which of the following statements is true?

A. det(2X) =
B. det(2X) = 2 det(X)
C. det(2X) = det(X)2

D. det(2X) = 4 det(X)

Answer: D
Explanation:

QUESTION NO: 61

What is the angle between the following two three dimensional vectors: a=(1,2,3), b=(-4,2,0)?

A. 90 degrees
B. 180 degrees
C. 57 degrees
D. 45 degrees

Answer: A
Explanation:

QUESTION NO: 62

Calculate the determinant of the following matrix:

A. 4.25
B. -4.25
C. 4
D. 2

Answer: D
Explanation:

QUESTION NO: 63

Let A be a square matrix and denote its determinant by x. Then the determinant of A transposed is:

A. x -1

B. x
C. ln(x)
D. -x

Answer: B
Explanation:

QUESTION NO: 64

Two vectors are orthogonal when:

A. one is a scalar multiple of the other
B. their components are linearly dependent
C. their determinant is zero
D. their scalar product (sum product) is zero

Answer: D
Explanation:

QUESTION NO: 65

Which of the following statements is true for symmetric positive definite matrices?

A. Its eigenvalues are all positive
B. One of its eigenvalues equals 0
C. If a is its eigenvalue, then -a is also its eigenvalue
D. If a is its eigenvalue, then is also its eigenvalue

Answer: A
Explanation:

QUESTION NO: 66

Stress testing portfolios requires changing the asset volatilities and correlations to extreme values. Which of the following would lead to a non positive definite covariance matrix?

A. Changing the volatilities to be greater than 100%
B. Changing all the correlations to be unity

C. Changing all the correlations to be zero
D. All of the above

Answer: B
Explanation:

QUESTION NO: 67

Every covariance matrix must be positive semi-definite. If it were not then:

A. Some portfolios could have a negative variance
B. It could not be used to simulate correlated asset paths
C. The associated correlation matrix would not be positive semi-definite
D. All the above statements are true

Answer: D
Explanation:

QUESTION NO: 68

The correlation between two asset returns is 0.5. What is the largest eigenvalue of their correlation matrix?

A. 0.5
B. 1
C. 1.5
D. None of the above

Answer: C
Explanation:

QUESTION NO: 69

The correlation between two asset returns is 1. What is the smallest eigenvalue of their correlation matrix?

A. 1
B. 0.5

C. 0
D. None of the above

Answer: C
Explanation:

QUESTION NO: 70

I have a portfolio of two stocks. The weights are 60% and 40% respectively, the volatilities are both 20%, while the correlation of returns is 50%. The volatility of my portfolio is

A. 16%
B. 17.4%
C. 20%
D. 24.4%

Answer: B
Explanation:

QUESTION NO: 71

I have a portfolio of two stocks. The weights are 60% and 40% respectively, the volatilities are both 20%, while the correlation of returns is 100%. The volatility of my portfolio is

A. 4%
B. 14.4%
C. 20%
D. 24%

Answer: C
Explanation:

QUESTION NO: 72

Suppose we perform a principle component analysis of the correlation matrix of the returns of 13 yields along the yield curve. The largest eigenvalue of the correlation matrix is 9.8. What

percentage of return volatility is explained by the first component? (You may use the fact that the sum of the diagonal elements of a square matrix is always equal to the sum of its eigenvalues.)

A. 64%
B. 75%
C. 98%
D. Cannot be determined without estimates of the volatilities of the individual returns

Answer: B
Explanation:

QUESTION NO: 73

Suppose I trade an option and I wish to hedge that option for delta and vega. Another option is available to trade. To complete the hedge I would

A. trade the underlying in such a way as to make the portfolio delta and vega neutral.
B. trade the other option in such a way as to make the portfolio delta and vega neutral.
C. trade the other option in such a way as to make the portfolio vega neutral, and then trade the underlying in such a way as to make the portfolio delta neutral.
D. trade the underlying in such a way as to make the portfolio delta neutral, and then trade the other option in such a way as to make the portfolio vega neutral.

Answer: C
Explanation:

QUESTION NO: 74

I have a portfolio of two stocks. The weights are equal. The one volatility is 30% while the other is 40%. The minimum and maximum possible values of the volatility of my portfolio are:

A. 30% and 40%
B. 5% and 35%
C. 10% and 40%
D. 10% and 70%

Answer: B
Explanation:

QUESTION NO: 75

A quadratic form is

A. defined as a positive definite Hessian matrix.
B. an algebraic expression in two variables, x and y,involving , and terms.
C. a specific solution of the Black-Scholes pricing formula
D. an algebraic expression in two variables, x and y, involving , , and terms.

Answer: B
Explanation:

QUESTION NO: 76

What is the probability of tossing a coin and getting exactly 2 heads out of 5 throws?

A. 8/15
B. 9/23
C. 10/32
D. None of these

Answer: C
Explanation:

QUESTION NO: 77

A biased coin has a probability of getting heads equal to 0.3. If the coin is tossed 4 times, what is the probability of getting heads at least two times?

A. 0.7367
B. 0.3483
C. 0.2646
D. None of these

Answer: B
Explanation:

QUESTION NO: 78

Your stockbroker randomly recommends stocks to his clients from a tip sheet he is given each day. Today, his tip sheet has 3 common stocks and 5 preferred stocks from Asian companies and 3 common stocks and 5 preferred stocks from European companies. What is the probability that he will recommend a common stock AND/OR a European stock to you when you call and ask for one stock to buy today?

A. 11/16
B. 7/8
C. 9/16
D. None of these

Answer: A
Explanation:

QUESTION NO: 79

In a portfolio there are 7 bonds: 2 AAA Corporate bonds, 2 AAA Agency bonds, 1 AA Corporate and 2 AA Agency bonds. By an unexplained characteristic the probability of any specific AAA bond outperforming the others is twice the probability of any specific AA bond outperforming the others. What is the probability that an AA bond or a Corporate bond outperforms all of the others?

A. 5/7
B. 8/11
C. 6/11
D. None of these

Answer: D
Explanation:

QUESTION NO: 80

Assume that 40% of all financial organizations investigated by authorities turn out to be fraudulent.

What is the probability of randomly investigating 2 different organizations and finding that neither is fraudulent; and what is the probability of finding exactly one being fraudulent?

A. 2/5 and 1/2
B. 2/5 and 3/5
C. 1/3 and 8/17
D. 9/25 and 12/25

Answer: D
Explanation:

QUESTION NO: 81

An asset price S is lognormally distributed if:

A. the change in price (dS) is normally distributed
B. 1/S is normally distributed
C. ln(dS/S) is normally distributed
D. ln(1+dS/S) is normally distributed

Answer: D
Explanation:

QUESTION NO: 82

Let f(x) = c for x in [0,4] and 0 for other values of x.

What is the value of the constant c that makes f(x) a probability density function; and what if f(x) = cx for x in [0,4]?

A. 1/4 and 1/7
B. 1/7 and 1/9
C. 1/4 and 1/6
D. None of the above

Answer: D
Explanation:

QUESTION NO: 83

An operational risk analyst models the occurrence of computer failures as a Poisson process with

an arrival rate of 2 events per year. According to this model, what is the probability of zero failures in one year?

A. 0.02
B. 0.14
C. 0.25
D. 0.50

Answer: B
Explanation:

QUESTION NO: 84

If A and B are two events with P(A) = 1/4, P(B) = 1/3 and P(A intersection B) =1/5, what is P(Bc | Ac) i.e. the probability of the complement of B when the complement of A is given?

A. 12/29
B. 37/45
C. 3/4
D. None of these

Answer: B
Explanation:

QUESTION NO: 85

There are two portfolios with no overlapping of stocks or bonds. Portfolio 1 has 6 stocks and 6 bonds. Portfolio 2 has 4 stocks and 8 bonds. If we randomly select one stock, what is the probability that it came from Portfolio1?

A. 0.3
B. 0.5
C. 0.6
D. None of these

Answer: C
Explanation:

QUESTION NO: 86

Let E(X) = 1, E(Y) = 3, Corr(X, Y) = -0.2, E(X2) = 10 and E(Y2) = 13. Find the covariance between X and Y

A. -2.8
B. 1.3
C. -1.2
D. None of the above

Answer: C
Explanation:

QUESTION NO: 87

On average, one trade fails every 10 days. What is the probability that no trade will fail tomorrow?

A. 0.095
B. 0.905
C. 0.95
D. 0.100

Answer: B
Explanation:

QUESTION NO: 88

If a random variable X has a normal distribution with mean zero and variance 4, approximately what proportion of realizations of X should lie between -4 and +4?

A. 66.60%
B. 90%
C. 95%
D. 99%

Answer: C
Explanation:

QUESTION NO: 89

Let X be a random variable distributed normally with mean 0 and standard deviation 1. What is the expected value of exp(X)?

A. E(exp(X)) = 1.6487
B. E(exp(X)) = 1
C. E(exp(X)) = 2.7183
D. E(exp(X)) = 0.6065

Answer: A
Explanation:

QUESTION NO: 90

Consider the following distribution data for a random variable X: What is the mean and variance of X?

A. 3.6 and 7.15
B. 3.4 and 3.84
C. 3.5 and 3.45
D. None of these

Answer: D
Explanation:

QUESTION NO: 91

Which of the following is a false statement concerning the probability density function and the cumulative distribution function of a random variable?

A. the PDF is non-negative.
B. the definite integral of the CDF from minus infinity to plus infinity is undefined.
C. the CDF approaches 1 as its argument approaches infinity.
D. the definite integral of the PDF from minus infinity to plus infinity is zero.

Answer: D

Explanation:

QUESTION NO: 92

Let N(.) denote the cumulative distribution function of the standard normal probability distribution, and N' its derivative. Which of the following is false?

A. N(0) = 0.5
B. N'(0) 0
C. N(x) 0 as x
D. N'(x) 0 as x

Answer: C
Explanation:

QUESTION NO: 93

Concerning a standard normal distribution and a Student's t distribution (with more than four degrees of freedom), which of the following is true?

A. The distributions have the same kurtosis.
B. The normal distribution has higher kurtosis than the t distribution.
C. The normal distribution has lower kurtosis than the t distribution.
D. Which has the higher kurtosis depends on the degrees of freedom of the t distribution.

Answer: C
Explanation:

QUESTION NO: 94

Let N(.) denote the cumulative distribution function and suppose that X and Y are standard normally distributed and uncorrelated. Using the fact that N(1.96)=0.975, the probability that X 0 and Y 1.96 is approximately

A. 0.25%
B. 0.488%
C. 0.49%
D. 0.495%

Answer: B
Explanation:

QUESTION NO: 95

Suppose a discrete random variable can take on the values -1, 0 and 1 each with a probability of 1/3. Then the mean and variance of the variable is

A. mean is 0, variance is 2/3
B. mean is 0, variance is 1/3
C. mean is 0, variance is 1/2
D. mean is 1/3, variance is 1/3

Answer: A
Explanation:

QUESTION NO: 96

Consider the linear regression model for the returns of stock A and the returns of stock B. Stock A is 50% more volatile than stock B. Which of the following statements is TRUE?

A. The stocks must be positively correlated ( )
B. Beta must be positive ( )
C. Beta must be greater in absolute value than the correlation of the stocks ( )
D. Alpha must be positive ( )

Answer: C
Explanation:

QUESTION NO: 97

Which of the following is consistent with the definition of a Type I error?

A. The probability of a Type I error is 100% minus the significance level
B. A Type I error would have occurred if the performance of a stock was positively correlated with the performance of a hedge fund, but in a linear regression, the hypothesis of positive correlation was rejected
C. A Type I error would have occurred if the performance of a stock was positively correlated with

the performance of a hedge fund, but in a linear regression, the hypothesis of no correlation was rejected
D. A Type I occurs whenever data series are serially correlated

Answer: B
Explanation:

QUESTION NO: 98

When the errors in a linear regression show signs of positive autocorrelation, which of the statements below is true?

A. The regression coefficient will be too high and the standard error of the regression coefficient will be understated
B. The regression coefficient will be too low and the standard error of the regression coefficient will be overstated
C. The regression coefficient will be unbiased, but the standard error of the regression coefficient will be understated
D. The regression coefficient will be unbiased, but the standard error of the regression coefficient will be overstated

Answer: D
Explanation:

QUESTION NO: 99

If a time series has to be differenced twice in order to be transformed into a stationary series, the original series is said to be:

A. non-linear
B. integrated of order 2
C. differential
D. non-functional

Answer: B
Explanation:

QUESTION NO: 100

A simple linear regression is based on 100 data points. The total sum of squares is 1.5 and the correlation between the dependent and explanatory variables is 0.5. What is the explained sum of squares?

A. 0.75
B. 1.125
C. 0.3333
D. 0.375

Answer: D
Explanation:

QUESTION NO: 101

A linear regression gives the following output:

Figures in square brackets are estimated standard errors of the coefficient estimates.

What is the value of the test statistic for the hypothesis that the coefficient of is less than 1?

A. 0.32
B. 0.64
C. 0.96
D. 1.92

Answer: B
Explanation:

QUESTION NO: 102

A linear regression gives the following output:

Figures in square brackets are estimated standard errors of the coefficient estimates. What is the value of the test statistic for the hypothesis that the coefficient of is zero against the alternative that is less than zero?

A. 0.125
B. 2.5

C. -1.25
D. -2.5

Answer: D
Explanation:

QUESTION NO: 103

A linear regression gives the following output:

Figures in square brackets are estimated standard errors of the coefficient estimates.

Which of the following is an approximate 95% confidence interval for the true value of the coefficient of ?

A. [0, 1.5]
B. [1, 2]
C. [0, 3]
D. None of the above

Answer: C
Explanation:

QUESTION NO: 104

Which of the following is not a direct cause of autocorrelation or heteroskedasticity in the residuals of a regression model?

A. A structural break in the dependent variable
B. A high positive correlation between two explanatory variables
C. The omission of a relevant explanatory variable
D. Using an inappropriate functional form in the model

Answer: B
Explanation:

QUESTION NO: 105

Which of the following can induce a 'multicollinearity' problem in a regression model?

A. A large negative correlation between the dependent variable and one of the explanatory variables
B. A high positive correlation between the dependent variable and one of the explanatory variables
C. A high positive correlation between two explanatory variables
D. The omission of a relevant explanatory variable

Answer: C
Explanation:

QUESTION NO: 106

You are given the following regressions of the first difference of the log of a commodity price on the lagged price and of the first difference of the log return on the lagged log return. Each regression is based on 100 data points and figures in square brackets denote the estimated standard errors of the coefficient estimates:

Which of the following hypotheses can be accepted based on these regressions at the 5% confidence level (corresponding to a critical value of the Dickey Fuller test statistic of – 2.89)?

A. The commodity prices are stationary
B. The commodity returns are stationary
C. The commodity returns are integrated of order 1
D. None of the above

Answer: D
Explanation:

QUESTION NO: 107

Maximum likelihood estimation is a method for:

A. Finding parameter estimates of a given density function
B. Estimating the solution of a partial differential equation
C. Solving a portfolio optimization problem
D. Estimating the implied volatility of a simple European option

Answer: A
Explanation:

QUESTION NO: 108

You are investigating the relationship between weather and stock market performance. To do this, you pick 100 stock market locations all over the world. For each location, you collect yesterday's mean temperature and humidity and yesterday's local index return. Performing a regression analysis on this data is an example of…

A. Simple time-series regression
B. Multiple time-series regression
C. Simple cross-section regression
D. Multiple cross-section regression

Answer: D
Explanation:

QUESTION NO: 109

Simple linear regression involves one dependent variable, one independent variable and one error variable. In contrast, multiple linear regression uses…

A. One dependent variable, many independent variables, one error variable
B. Many dependent variables, one independent variable, one error variable
C. One dependent variable, one independent variable, many error variables
D. Many dependent variables, many independent variables, many error variables

Answer: A
Explanation:

QUESTION NO: 110

You want to test the hypothesis that a population parameter of a regression model is zero. Your alternative hypothesis is that 0. Denote by SD() the estimated standard deviation of , and by MEAN() the estimated mean of . Which test statistic is appropriate, and what is its distribution?

A. test statistic = SD()/MEAN(), normal distribution

B. test statistic = MEAN()/SD(), normal distribution
C. test statistic = SD()/MEAN(), t distribution
D. test statistic = MEAN()/SD(), t distribution

Answer: D
Explanation:

QUESTION NO: 111

In a multiple linear regression, the significance of R2 can be tested using which distribution?

A. Normal distribution
B. Student's t distribution
C. F-distribution
D. Binomial distribution

Answer: C
Explanation:

QUESTION NO: 112

Exploring a regression model for values of the independent variable that have not been observed is most accurately described as…

A. Estimation
B. Regression
C. Hypothesis testing
D. Prediction

Answer: D
Explanation:

QUESTION NO: 113

Which of the following statements are true about Maximum Likelihood Estimation?

(i) MLE can be applied even if the error terms are not i.i.d. normal.

(ii) MLE involves integrating a likelihood function or a log-likelihood function.

(iii) MLE yields parameter estimates that are consistent.

A. (i) and (ii)
B. (i) only
C. (i) and (iii)
D. (i), (ii), and (iii)

Answer: C
Explanation:

QUESTION NO: 114

In statistical hypothesis tests, 'Type I error' refers to the situation in which…

A. The null hypothesis is accepted when in fact it should have been rejected
B. The null hypothesis is rejected when in fact it should have been accepted
C. Both null hypothesis and alternative hypothesis are rejected
D. Both null hypothesis and alternative hypothesis are accepted

Answer: B
Explanation:

QUESTION NO: 115

A 95% confidence interval for a parameter estimate can be interpreted as follows:

A. The probability that the real value of the parameter is within this interval is 95%.
B. The probability that the real value of the parameter is outside this interval is 95%.
C. The probability that the estimated value of the parameter is within this interval is 95%.
D. The probability that the estimated value of the parameter is outside this interval is 95%.

Answer: A
Explanation:

QUESTION NO: 116

Which of the following can be used to evaluate a regression model?

(i) Magnitude of R2

(ii) Magnitude of TSS (total sum of squares)

(iii) Tests for statistical significance

(iv) Sign and magnitude of each regression parameter

A. (i) and (iv)
B. (i), (ii), and (iii)
C. (i), (iii), and (iv)
D. (i), (ii), (iii), and (iv)

Answer: C
Explanation:

QUESTION NO: 117

You are to perform a simple linear regression using the dependent variable Y and the independent variable X (Y = a + bX). Suppose that cov(X,Y)=10, var(X)= 5, and that the mean of X is 1 and the mean of Y is 2. What are the values for the regression parameters a and b?

A. b=0.5, a=2.5
B. b=0.5, a=1.5
C. b=2, a=4
D. b=2, a=0

Answer: D
Explanation:

QUESTION NO: 118

What can be said about observations of random variables that are i.i.d. a normally distributed?

A. The estimated mean divided by the estimated variance has a t-distribution
B. The estimated mean divided by the estimated variance has a Chi2-distribution
C. The estimated mean divided by the estimated standard deviation has a t-distribution
D. The estimated mean divided by the estimated standard deviation has a Chi2-distribution

Answer: C
Explanation:

QUESTION NO: 119

Newton-Raphson iteration is used to find a solution of x5 - x3 + x = 1. If xn = 2, what is xn+1?

A. 2.362
B. 1.623
C. 1.638
D. 0.377

Answer: C
Explanation:

QUESTION NO: 120

Consider a binomial lattice where a security price S moves up by a factor u with probability p, or down by a factor d with probability 1 - p. If we set d > 1/u then which of the following will be TRUE?

A. The lattice will not recombine
B. The probability of an up move will not be constant
C. There will always be a downward drift in the lattice
D. None of the above

Answer: D
Explanation:

QUESTION NO: 121

An option has value 10 when the underlying price is 99 and value 9.5 when the underlying price is 101. Approximate the value of the option delta using a first order central finite difference.

A. -4
B. 0.25

C. -0.5
D. -0.25

Answer: D
Explanation:

QUESTION NO: 122

When calculating the implied volatility from an option price we use the bisection method and know initially that the volatility is somewhere between 1% and 100%. How many iterations do we need in order to determine the implied volatility with accuracy of 0.1%?

A. 10
B. 100
C. 25
D. 5

Answer: A
Explanation:

QUESTION NO: 123

The bisection method can be used for solving f(x)=0 for a unique solution of x, when

A. The function f(x) is continuous and monotonic
B. The function f(x) is differentiable
C. The function f(x) is differentiable and we have an explicit expression for the derivative
D. The function f(x) is continuous

Answer: A
Explanation:

QUESTION NO: 124

What is a Hessian?

A. Correlation matrix of market indices
B. The vector of partial derivatives of a contingent claim

C. A matrix of second derivatives of a function
D. The point at which a minimum of a multidimensional function is achieved

Answer: C
Explanation:

QUESTION NO: 125

The Newton-Raphson method

A. is based on finding a middle point between left and right end of the search interval
B. is based on Taylor series and uses the first derivative
C. can be used for continuous but not differentiable functions
D. does provide an error bound along with every iteration

Answer: B
Explanation:

QUESTION NO: 126

The gradient of a smooth function is

A. a vector that shows the direction of fastest change of a function
B. matrix of second partial derivatives of a function
C. infinite at a maximum point
D. a matrix containing the function's second partial derivatives

Answer: A
Explanation:

QUESTION NO: 127

The gradient of a function f(x, y, z) = x + y2 - x y z at the point x = y = z = 1 is

A. (0, 2, 1)
B. (0, 0, 0)
C. (1, 1, 1)
D. (0, 1, -1)

Answer: D
Explanation:

QUESTION NO: 128

Variance reduction is:

A. A technique that is applied in regression models to improve the accuracy of the coefficient estimates
B. A numerical method for finding portfolio weights to minimize the variance of a portfolio that has a given expected return
C. A numerical method for finding the variance of the underlying that is implicit in a market price of an option
D. A method for reducing the number of simulations required in a Monte Carlo simulation

Answer: D
Explanation:

QUESTION NO: 129

A 2-step binomial tree is used to value an American put option with strike 104, given that the underlying price is currently 100. At each step the underlying price can move up by 20% or down by 20% and the risk-neutral probability of an up move is 0.55. There are no dividends paid on the underlying and the discretely compounded risk free interest rate over each time step is 2%. What is the value of the option in this model?

A. 11.82
B. 12.33
C. 12.49
D. 12.78

Answer: C
Explanation:

QUESTION NO: 130

In a binomial tree lattice, at each step the underlying price can move up by a factor of u = 1.1 or down by a factor of ． The continuously compounded risk free interest rate over each time step is

1% and there are no dividends paid on the underlying. The risk neutral probability for an up move is:

A. 0.5290
B. 0.5292
C. 0.5286
D. 0.5288

Answer: D
Explanation:

QUESTION NO: 131

A 2-step binomial tree is used to value an American put option with strike 105, given that the underlying price is currently 100. At each step the underlying price can move up by 10 or down by 10 and the risk-neutral probability of an up move is 0.6. There are no dividends paid on the underlying and the continuously compounded risk free interest rate over each time step is 1%. What is the value of the option in this model?

A. 7.12
B. 6.59
C. 7.44
D. 7.29

Answer: A
Explanation:

QUESTION NO: 132

In a 2-step binomial tree, at each step the underlying price can move up by a factor of u = 1.1 or down by a factor of d = 1/u. The continuously compounded risk free interest rate over each time step is 1% and there are no dividends paid on the underlying. Use the Cox, Ross, Rubinstein parameterization to find the risk neutral probability and hence find the value of a European put option with strike 102, given that the underlying price is currently 100.

A. 5.19
B. 5.66
C. 6.31
D. 4.18

Answer: C

Explanation: