

**Applied Mathematics for Biomedical Technology**

 **BMT (222) Time: 120 Minutes**

**King Saud University**

**College of Applied Medical Sciences**

**Biomedical Technology Department**

**First Midterm(بديل)**

**Course Instructor: Dr. Widad Babiker**

**Course No. 222, first Semester 1442-1442**

**Date Time: Thursday 3/3/1442ه**

**الموافق 20/10/2020**

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| **Student’s Name** |  |
| **Student’s** ID |  |

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| **Question No.** |  |  |  |  | **Total** |
| Maximum Marks |  |  |  |  |  |
| Obtained Marks |  |  |  |  |  |

Question I

1. **Fill in the blanks (two of these)**
2. is equivalent to the exponential form \_\_\_\_ ,
3. If then \_\_\_\_\_\_\_\_\_\_\_\_ 3
4. , then is equal to \_\_\_\_\_\_\_\_\_\_\_\_
5. is equal to \_\_\_\_\_\_\_\_\_\_\_\_
6. is equal to \_\_\_\_\_\_\_\_\_\_\_\_
7. If then \_\_\_\_\_\_\_\_\_\_\_\_
8. To solve by completing the square, add \_\_\_\_\_ to both sides of the equation
9. if then \_\_\_\_\_\_\_\_\_\_\_\_
10. The exponential form **of**  is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. The range of possible values of an angle such that and is \_\_\_\_\_\_
12. **Choose the correct answer:**
13. is equal to

 (a) (b) (c) (d) None of the previous

1. is equal to

(a) (b) (c) (d) None of the previous

1. If and is an acute angle then the exact value of is equal to

(a) (b) (c) (d) None of the previous

1. is equal to

(a) (b) (c) (d) None of the previous

1. is equal to

(a) (b) (c) (d) None of the previous

1. is equal to

 (a) (b) (c) (d) None of the previous

1. is equal to

 (a) (b) (c) (d) None of the previous

1. Which equation is equivalent to ?

 (a) (b) (c) (d)

Question 2 (all details are needed)

1. Prove the given identity
2. Prove the given identity
3. Prove the given identity
4. Prove the given identity

Question 3 (write all details)

1. Express the quotient in simplest form: 
2. Express the quotient in simplest form:
3. Express the quotient in simplest form:
4. Simplify the complex fraction
5. Simplify the complex fraction
6. Simplify the complex fraction

Question 4

1. Find the partial fraction decomposition of **** (write all details)
2. Resolve into partial fractions (all details are needed)
3. Find the partial fraction decomposition of (write all details)

Question 5

1. Solve the equation by completing the square: (Write all details)
2. Solve the equation by completing the square:
3. Solve the equation by completing the square:
4. Solve the equation by completing the square:
5. Solve the given equation for (all details are needed)
6. Solve the given equation for (all details are needed)
7. Solve the given equation for (all details are needed)
8. Solve the given equation for
9. Solve the given equation for (all details are needed)
10. Solve the given equation for (all details are needed)
11. Solve the given equation for

Question 6

1. A weight of 1Ib and a lever are used to determine two other weights (see the figure below). Given, the lever balances when and and when , an. Determine the weights and (write all details)
2. A weight of 2.0 N and a lever are to be used to determine two other weights (see the figure below). A balance is obtained if and and if , an. Determine the weights and (write all details)



Question 7

1. Find the value of that satisfies the following system of equations by using

 Cramer rule (all details are needed)

1. By using Cramer’s rule to solve following systems of equations find the value of

(all details are needed)

Question 8 **(Write all details)**

1. Use implicit differentiation to find if Also simplify the result
2. Use implicit differentiation to find if Also simplify the result
3. Find the second derivative and simplify, where y is given by:
4. Find  where *y*(*x*) is defined by,  . (all details are needed)
5. Find the value of where y is given by:

Question 9 **(Write all details)**

1. Find The rate of change of at .
2. Evaluate the average rate of change of across the interval to

Question 10 **(Write all details)**

1. If and are acute angles s.t and find
2. In : . Find c
3. Given , and in . Find .
4. In : , find AB.

Question 11 (All details are required)

1. Show that Maclaurin series for the function Hence find Maclaurin series for

Question 12 (All details are required)

1. If , then find .
2. Evaluate
3. For the complex number, and Evaluate in
4. Using De Moivre’s theorem. Compute the for a complex number
5. Find all the cube roots of 8. Write roots in rectangular form.

Question 13 (All details are required)

1. A ladder 20ft long leans against the side of a building, and the angle between the ladder and the building is . Find the distance from the bottom of the ladder to the building.
2. When the angle of elevation of the sun is 64°, a telephone pole that is tilted at an angle of 9° directly away from the sun casts a shadow 21 feet long on level ground. Find the length of the pole.
3. Suppose a person standing atop a building 398 feet tall throws a ball upward. If the person releases the ball 4 feet above the top of the building, the ball’s height *h*, in feet, after *t* seconds is given by the equation . After how many seconds will the ball be 338 feet from the ground? (a) (b) (c)
4. Solve the equation by completing the square: A box with a square base and no top is to be made from a square piece of tin by cutting out a 3-inch square from each corner and folding up the sides. If the box is to hold 48 in3, what size piece of tin should be used? (write all details)
5. Two forces of 55.0 lb. and 37.0 lb. respectively, are acting on the same object. If the angle between their directions is 23.4°, what single force would produce the same effect?

1. Solve the equation by completing the square: A box with a rectangular base its width is 4ft shorter than its length and height 3 with volume 36 in3. Find the length and width
2. The volume of the cuboid is 5000cm³.
3. The surface area of the cuboid is 270cm². (a) Show x² + 4x − 45 = 0 (4) (b) Find x. .....................................cm (2) (c) Find the volume of the cuboid.
4. You launch a toy rocket from a height of 5 feet. The height (h, in feet) of the rocket 𝑡𝑡 seconds after taking off is given by the formula ℎ = −3𝑡𝑡2 + 14𝑡𝑡 + 5. a) How long will it take for the rocket to hit the ground? b) Find the time when the rocket is 5 feet from hitting the ground.
5. The length of a rectangle is three more than twice the width. Determine the dimensions that will give a total area of 27 m2 . What is the minimum area that this rectangle can have?
6. We are going to fence in a rectangular field and we know that for some reason we want the field to have an enclosed area of 75 ft2 . We also know that we want the width of the field to be 3 feet longer than the length of the field. What are the dimensions of the field?
7. The length of one leg of a right triangle is 2 feet longer than the other leg. The length of the hypotenuse is 10 feet. Find the lengths of the two legs.
8. A rectangular field is 30m longer than wide. The area of the field is 8800m² Work out the perimeter of the field.
9. The perimeter of a triangle is and the lengths of two of the sides are and . Find the length of the third side.

Which equation is equivalent to

the value of *a* in the equation is equal to