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**m<uq jk jdr mÍCIKh - 2024**

**First Term Examination - 2024**

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**COMBINED MATHEMATICS – I**

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* **Answer all the questions from Part A and only five questions from Part B.**

**Part A**

01. Prove by the mathematical induction, that is divisible by for .

02. Solve the equation

03. Solve the inequality for **,**

04. Determine the ratio in which the line divides the segment joining the points and

05. Show that,

06. If then show that,

07. If  then prove that,

08. Find the equation of the line passing through the intersection of the lines and ,cutting of equal intercepts on the coordinate axes.

09. Show that,

10. Find the area bounded by line ,and axis, and the curve .

**Part B**

11. a). If  **,**  are the roots of the quadratic equation  , where , and are real constants. Find expressions for  **+**  and in terms of , and .

Let and be the roots of the equation , where is a real constant.

i). Find the set of values of for which and are real.

ii). Obtain an equation of the from , whose roots are and , expressing the constants and in terms of .

b). When the polynomial is divided by , the remainder is . When it is divided by , the remainder is . Find and . Find the remainder when is divided by .

12. a). Express in partial fractions,

b). If and are two positive numbers then show that .

If , and are positive numbers, prove that .

c). Sketch, in the same figure, the graphs of and .

Hence or otherwise find the set of values of for which,

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13. a). is a triangle and the equations of the sides , and are , and . Two lines perpendicular to and passing through and another line passing through and parallel to intersect at the point .

i). Find the equations of the lines and .

ii). Show that is a rhombus.

b). Find the equation of the acute angle bisector of the lines and

14. a). Let for ,

Show that , the derivative of , is given by

for ,

Hence, find intervals on which is increasing and the intervals on which is decreasing.

Sketch the graph of indicating the asymptotes, intercept and the turning points.

b). Show that the maximum volume of cylinder that can be contained in a cone of height and radius , such that their axes coincide is .

15. a). Integrate,

b). Show that

c). Using integration by parts, find

d). Using the substitution for

Evaluate,

16. a). Given that

Hence show that,

b). Let be a triangle. In the usual notation, using the result

Show that,

i).

ii).

c). Find the general solution of the equation,

d). Solve the equation,