**Calculator Free**

**Differentiation Techniques**

Time: 45 minutes

Total Marks: 45

Your Score: / 45



**Question One: [1, 2, 3, 3, 3, 3, 3 = 18 marks] CF**

Differentiate each of the following functions with respect to *x*. Do not simplify your answers.

1. 
2. 
3. 
4. 
5. 
6. 
7. 

**Question Two: [4 marks] CF**

Show, using the quotient rule, that  .

**Question Three: [4 marks] CF**

A curve is defined parametrically as  and  .

Determine an expression for the rate of change of *y* with respect to *x*, in terms of *x* only. Simplify your answer.

**Question Four: [5 marks] CF**

Given that  , show that 

**Question Five: [2 marks] CF**

Given  and  , determine  .

**Question Six: [5 marks] CF**

By using first principles and the limits  and  , establish that  .

Remember that  .

**Question Seven: [3, 4 = 7 marks] CF**

1. Calculate the gradient of the curve  at  .
2. Determine the equation of the tangent to the curve  at  .

**SOLUTIONS**

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By using first principles and the limits  and  , establish that  .

Remember that  .



**Question Seven: [3, 4 = 7 marks] CF**

1. Calculate the gradient of the curve  at  .



 

1. Determine the equation of the tangent to the curve  at  .



