Group Number:

Members:

1. ____________________________
2. ____________________________
3. ____________________________
4. ____________________________

You will take turns sharing the work you did in the worksheet with one another and writing a set of answers on this master copy. At the end, you will hand in this master copy as well as the individual sheets of each group member.

For all problems, as part of your answer you should write down the section in the textbook that relates to the problem. (How might you figure this out?)

Each person write out the answer to the problem. Check that everyone in the group understands. If someone does not understand, she should ask for clarification. Then pass the sheet to the next person.

Differential Calculus:  1. Give the derivative of each of the following functions:

a. (Person 1) \( \frac{d}{dx} x^3 = \) \hspace{1cm} (Person 2) \( \frac{d}{dx} \sin(x) = \)

b. (Person 3) \( \frac{d}{dx} \cos(x) = \) \hspace{1cm} (Person 4) \( \frac{d}{dx} (3x + 5)^{12} = \)

2. Write out each of the following rules of differentiation and then illustrate the rule by making up and working out an example. Number 1 is already done for you.

Here one person will write out the rule and write down their example. Then the next person will solve the example.

a. Constant Rule: \( \frac{d}{dx} c = 0, \quad \frac{d}{dx} 7 = 0 \)
b. (Person 1 gives rule and example) Linearity Rule: \[ \frac{d}{dx} (f(x) + g(x)) = \]
(Person 2 solves the example)

c. (Person 3 gives rule and example) Product Rule: \[ \frac{d}{dx} (f(x) g(x)) = \]
(Person 4 solves the example)

d. (Person 2 gives rule and example) Quotient Rule: \[ \frac{d}{dx} \left( \frac{f(x)}{g(x)} \right) = \]
(Person 1 solves the example)
e. (Person 4 gives the rule and one example. Person 2 gives one example)

Chain Rule: $\frac{d}{dx} f(g(x)) =$

(Person 3 and Person 1 each solve an example)

3. (Person 2) State the formal definition of the derivative of a function:

$f'(x) =$

4. (Person 3) Give the equation of the tangent line to the graph $y = f(x) = 3x^2$ that goes through the point $(x = 1, y = 3)$. Show the steps behind your work.
Integral Calculus

5. Evaluate the following integrals. Write out all steps as clearly as possible.

a. (Person 4) \( \int (3x^2 + 4x - 5) \, dx = \)

b. (Person 1) \( \int_0^1 (2x + 1)^7 \, dx = \)

c. (Person 2) \( \int \sin(x) \, dx = \)

d. (Person 3) \( \int_0^{\pi/2} \cos(2x) \, dx = \)
6. (The whole group) In evaluating the above integrals, you have used the Fundamental Theorem of Calculus which shows that there is a relationship between derivatives and integrals. Write out what the Fundamental Theorem of Calculus says:

7. (The whole group) Although we often evaluate integrals using the Fundamental Theorem of Calculus, this is not the technical definition of the integral. In your own words, explain the definition of an integral.