

Final Study Guide

Basic Skills:(40%) Use short cuts and do not simplify.

Derivatives:

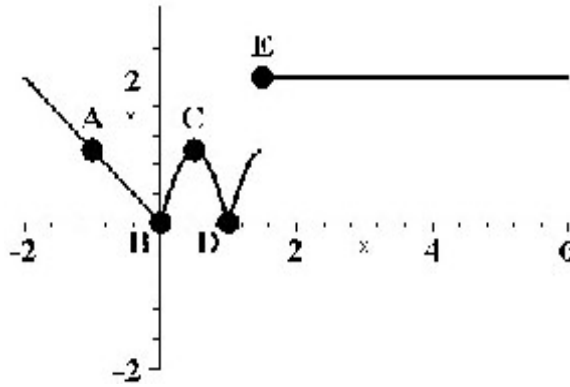
1. Basic Derivative (Power, Sum/Difference, Constant Multiple, & Constant Rule)
2. Complicated Derivative (Power, Sum/Difference, Constant Multiple, & Constant Rule)
3. Product Rule
4. Quotient Rule
5. Chain Rule
6. Chain Rule/Product Rule Combo
7. Chain Rule/Quotient Rule Combo
8. Chain Rule in Chain Rule Combo
9. Find the slope at of a parametric equation at a particular point
10. Logarithmic Differentiation

Integrals:

11. Basic Integral (Power, Sum/Difference, Constant Multiple, & Constant Rule)
12. Complicated Integral (Power, Sum/Difference, Constant Multiple, & Constant Rule)
13. Integral involving Trigonometric & Exponential Functions
14. Integral involving Trigonometric & Exponential Functions
15. Integral with a Basic Substitution
16. Basic Definite Integral (Power, Sum/Difference, Constant Multiple, & Constant Rule)
17. Complicated Definite Integral (Power, Sum/Difference, Constant Multiple, & Constant Rule)
18. Definite Integral involving Trigonometric & Exponential Functions

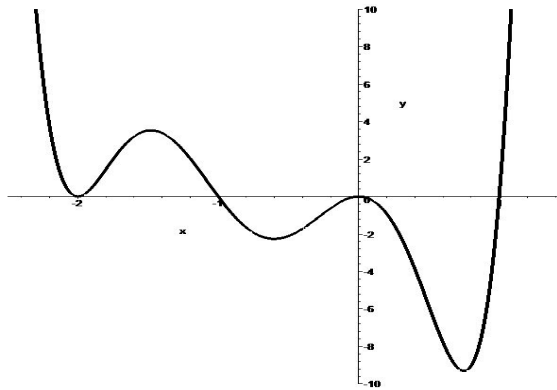
Theory & Knowledge:(30%)

1. The Derivative is the *Slope of the Tangent Line* and the *Instantaneous Rate of Change*.
2. Definition of the Limit.
3. Definition of Continuous.
4. Definition of Differentiable (A definition with substance!!!).
5. Given $f(x)$, a , L , and ϵ find δ so that if $|x - a| < \delta$ then $|f(x) - L| < \epsilon$.
6. Given a graph such as



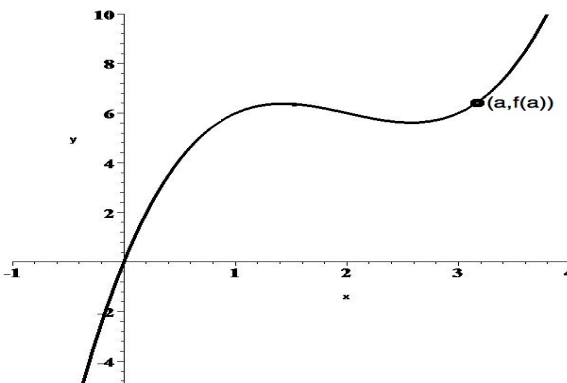
identify where the function is continuous, differentiable, both, or neither.

7. Given a graph of a function such as



sketch a possible graph of the derivative function.

8. Given the following graph



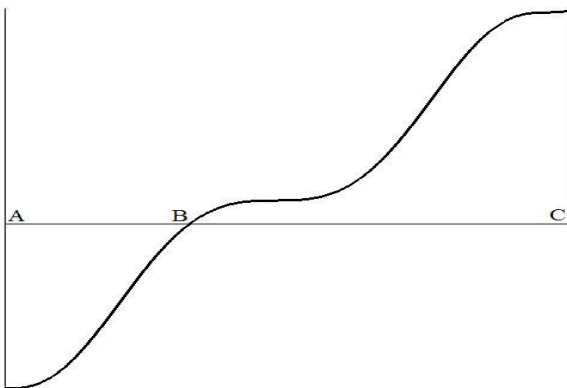
explain in terms of limits, secants, and tangents what the derivative is and how it is found. Add appropriate lines and points to the graph to help illustrate your explanation.

9. Given a function $f(x)$ using limits find the derivative and find the equation of the tangent line.

10. Definition of Antiderivative versus Indefinite Integral.

11. Definition of Definite Integral.

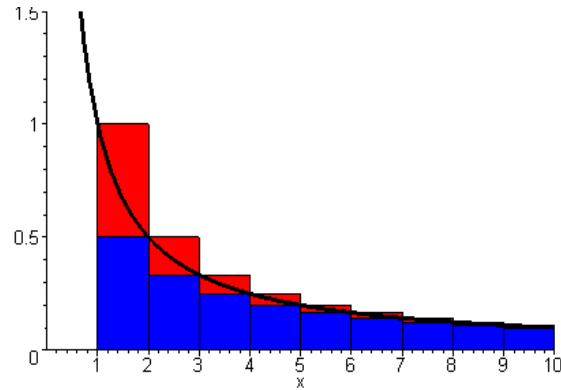
12. Given:



answer the following:

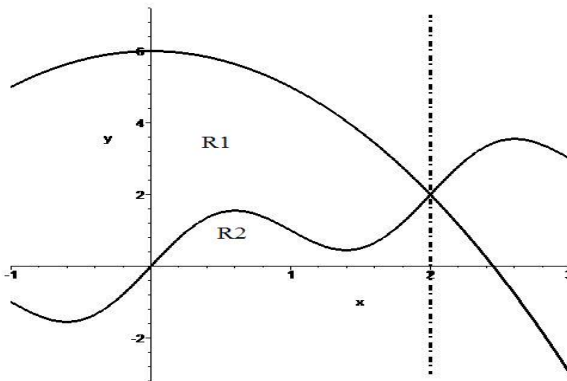
- (a) Is the Derivative positive or negative over the given interval?
- (b) Is the Definite Integral positive or negative over the given interval?
- (c) If this curve represents velocity:
 - i. When is the object moving up?
 - ii. When is the object moving down?
 - iii. How do we find the total displacement of the object?
 - iv. How do we find the total distance traveled by the object?

13. Given:



If $f(x) = \frac{1}{x}$ then give an approximation of the area under between 1 and 9 the curve using either a right box or left box approximation with 9 intervals. Then use a definite integral to evaluate the actual area.

14. Given:



If $f(x) > g(x)$ on the interval from 0 to 2 then in terms of the areas $R1$ and $R2$ what is the value of:

(a) $\int_0^1 f(x) - g(x) dx$

(b) $\int_0^1 f(x) dx$

(c) $\int_0^1 g(x) dx$

Applications:(30%)

1. Related Rates Problem, do one of three.
2. Parametric Equations Problem.
3. Graphing Problem, do one of three.
4. Optimization Problem, do one of three.
5. Extra Credit, do one of the above problems that you did not already do.