

Exam III Review Topics

- I. Linear Approximation and Differentials
- a. Tangent line approximation to $y = f(x)$ at $x = a$
$$y = L(x) = f(a) + f'(a)(x - a)$$
- b. Linear Approximation of $y = f(x)$ at $x = a$
$$y = L(x) = f(a) + f'(a)(x - a)$$
- c. Linearization of $y = f(x)$ at $x = a$
$$y = L(x) = f(a) + f'(a)(x - a)$$
- II. Differential of $y = f(x)$ 3.8:8,11,12,14(8,11)
- $$dy = f'(x)dx$$
- $$df = f'(x)dx$$
- a. Differential Rules
- b. Error Estimation 3.8:19,31,34(19,34)
1. Relative Error
 2. Percentage Error
- III. Newton's Method 3.8:49,50(49)
- a. Let $x = x_n$ be a suitable estimate for a root of a function $y = f(x)$. Then,
- $$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$
- is an improved estimate for the root of $y = f(x)$.
- IV. Extreme Values 4.1:4,6,9,14(6,14)
- a. Definition of Absolute Maximum/Minimum of a Function $y = f(x)$ on an Interval I
- b. Extreme Value Theorem for a Continuous Function Defined a Closed Bounded Interval
- c. Definition of Relative Maximum/Minimum of a function $y = f(x)$ on an Interval I
- d. Definition of Critical Numbers of a Function $y = f(x)$ on an Interval I
- e. Critical Number Theorem
- V. Algorithm for Finding Absolute Maxima /Minima for a Continuous Function Defined on a Closed Bounded Interval 4.1:18,20,25,26(20,26)
- VI. Rolle's Theorem
- VII. Mean Value Theorem 4.2:7,9,10(9)
- a. Verify the Mean Value Theorem

- VII. Sketching the Graph of a Function
 - a. Definition for a Function $y = f(x)$ to be Strictly Increasing/Decreasing on an Interval I 4.3:12,13,16,17(13)
 - b. Monotone Function Theorem
 - c. First Derivative Test for Relative Extrema 4.3:37,38(37)
 - d. Definition for a Function $y = f(x)$ to be Concave Up/Down on an Interval I
 - e. Concavity Theorem
 - f. Definition of an Inflection Point of a Graph of a Function $y = f(x)$
 - g. Second Derivative Test for Relative Extrema 4.3:40,42(42)
- VIII. Algorithm for Sketching the Graph of a Function 4.3:21,23,27,30(21,27)
- IX. Limits at Infinity 4.4:7,10,12,13,23(10,12)
 - a. Limit Rules
 - b. Special Limits
 - c. Horizontal Tangent Lines
- X. Infinite Limits 4.4:15,20(15)
 - a. Vertical Tangent Lines
- XI. Algorithm for Sketching the Graph of a Function with Asymptotes 4.4:27,29,30,38(27,38)
- XII. l'Hôpital's Rule
 - a. Indeterminate Forms
 - 1. $0/0$ ∞/∞ 4.5:3,8,10,12,17,28(3,12,28)
 - 2. 1^∞ $0 \cdot \infty$ 0^0 ∞^0 $\infty - \infty$ 4.5:30,33,38,42,47(30,33,38,47)