

Concepts from Exam 1

- Section 1.1: The Coordinate System and functions.
 - Coordinate system
 - * ordered pairs
 - * scatter plot
 - Standardize values of data
 - Functions
 - * independent and dependent variables
 - * domain and range
 - algebraically
 - graphically
 - * vertical line test
 - * evaluating
 - Interval notation (open and closed intervals)
 - price-demand function
 - * interpret
- Section 1.2: Linear functions and Average Rate of Change.
 - equation of a line
 - * Average rate of change (ie slope of line)
 - * point slope formula
 - * slope intercept form
 - * Intercepts
 - cost function (linear model)
 - linear depreciation
 - increasing, decreasing, and constant functions
 - piecewise defined functions
 - * graphing
 - * evaluating
- Section 1.3: Quadratic functions and average rate of change on an interval.
 - parabola formula
 - * vertex.
 - * domain/range
 - * maximum or minimum value
 - * roots (zeroes)
 - factoring
 - quadratic formula
 - calculator
 - * average rate of change
- Section 1.4: Operations on functions
 - sum, difference, product, and quotient
 - price-demand function, cost function, revenue function, profit function.
 - break-even points
 - polynomial functions
 - * End behavior
 - * Maximum and Minimum commands
- Section 1.5: Rational, radical, and power functions.
 - rational functions
 - * vertical asymptotes
 - * Horizontal Asymptote
 - * Intercepts
 - radical functions
 - * domain
 - power functions
- Section 1.6: Exponential functions.
 - formulas
 - * $y = a * b^x$
 - * $y = a * e^{bx}$
 - growth and decay
 - compound interest
 - continuous interest
 - logistic curves
 - * point of diminishing return
- Section 1.7: Logarithmic functions.
 - composition
 - logarithms
 - log rules
- Section 1.8: Regression and Mathematical Models
 - standardizing the independent variable
 - scatter plot
 - correlation coefficient r
 - * good fit if r^2 is close to 1
 - * bad fit if r^2 is close to 0

- methods of regression
 - * linear
 - * polynomial
 - * exponential
 - * logarithmic
 - * logistic

Concepts from Exam 2

- Section 2.1: Limits
 - limits from the left and from the right
 - numerically
 - graphically
 - algebraically
 - * form of $\frac{0}{0}$
 - * form of $\frac{k}{0}$ with $k \neq 0$
- Section 2.2: Limits and asymptotes
 - Vertical asymptote
 - * rational functions
 - * logarithmic functions
 - limits to infinity (horizontal asymptotes)
 - * exponential functions
 - * rational functions
- Section 2.3: Instantaneous rate of change and the derivative
 - slope of the tangent line is the same as the instantaneous rate of change.
 - find the equation of the tangent line
 - nderive command on the calculator and how it is used.
- Section 2.4: Derivative rules
 - notation, $f'(x)$, y' , $\frac{dy}{dx}$
 - Derivative shortcut rules
 - * constant
 - * power
 - * sum and difference
- Section 2.5: Derivative rules
 - product rule
 - quotient rule

- Section 2.6: Continuity and non differentiability
 - definition of continuity
 - where functions are continuous and are not continuous
 - * polynomials
 - * rational functions
 - * exponential functions
 - * piecewise functions
 - places where $f(x)$ is not differentiable
 - * where $f(x)$ is not defined
 - * where $f(x)$ is not continuous
 - * where $f(x)$ has a sharp point(sharp turning)
 - * where the tangent line is vertical
- Section 3.2: Marginal analysis
 - Notation
 - * $AC(x) = \frac{C(x)}{x}$ is the average cost function.
 - * $MC(x)$ is marginal cost function. The derivative of the cost function.
 - * $MAC(x)$ is the marginal average cost function. The derivative of the average cost function.
 - * The **actual** cost of A+1 item is computed by $C(A+1) - C(A)$.
 - * The **approximate** cost of the A+1 item is computed by $MC(A)$.
 - similar definitions for revenue and profit functions(see page 206).
- Section 4.1: Chain rule(generalized power rule)
- Section 4.2: Derivatives of logarithmic functions.
 - Using logarithm rules to simplify the function before taking the derivative.
- Section 4.3: Derivative of exponential functions.
- Additional topics with derivatives.
 - Being able to simplify a derivative.
 - finding the values of x where the function has a instantaneous rate of change of (pick your favorite number). To solve this take the derivative and set it equal to (your favorite number) and solve for x.

Concepts from Exam 3

- Section 5.1: First derivative and graphs
 - Finding critical values.
 - * MUST be in the domain
 - * where $f'(x) = 0$ or $f'(x)DNE$
 - Classifying critical values as
 - * Relative maximum
 - * relative minimum
 - * neither
 - Finding intervals where $f(x)$ is increasing/decreasing
 - first derivative test using a sign chart
- Section 5.2: Second derivative.
 - higher order derivatives: second derivative $f''(x)$, third derivative $f'''(x)$, fourth derivative $f^{(4)}(x)$
 - Finding possible inflection values
 - * MUST be in the domain
 - * where $f''(x) = 0$ or $f''(x)DNE$
 - Finding the intervals of concavity
 - * Concave up means second derivative is positive
 - * concave down means second derivative is negative.
 - inflection points.
 - interpretation of the inflection point.
- Section 5.3: Graphical analysis and curve sketching
 - Second derivative test
 - Curve Sketching Strategy(these steps do not need to be memorized)
 1. Domain
 2. intercepts
 3. asymptotes
 4. first derivative information
 - * critical values
 - * increasing/decreasing
 - * relative min/max
 5. second derivative information
 - * concave up/down
 - * inflection points
 6. Sketch the graph
 - Given the information about a function, sketch a graph.
- Section 5.4 and 5.5: Optimizing functions
 - Absolute maximum/minimum
 - * If the interval is a closed interval and the function is continuous on the interval,
 1. find critical values
 2. check the critical values in the interval and the ends of the interval to find the abs max and abs min
 - * if the interval is not closed OR the function is not continuous on the interval, then do curve sketching strategy to find abs max/min.
 - Word problems. All of the problems covered in class are fair game.
 - The second derivative test (page 332)
- Section 6.1: Indefinite integral
 - Integration rules
 - Find $f(x)$ if given $f'(x)$ and a point on the function.
- Section 6.2: Area and the definite integral
 - Riemann sum: Don't worry about computing a Riemann sum, just understand the process.
 - * Left sum
 - * Right sum
 - * midpoint
 - When a Riemann sum is an over or under estimate.
 - The definite integral, $\int_a^b f(x)dx$, means to perform a Riemann sum with an infinite number of rectangles.
 - If $f(x) \geq 0$ on the interval $[a, b]$ then $\int_a^b f(x)dx$ represents area
 - If $f(x) \not\geq 0$ on the interval $[a, b]$ then $\int_a^b f(x)dx$ represents a difference of area.
 - Area below the x-axis is counted as negative area by the Riemann sum.
- Section 6.4: Integration by u-substitution
 - indefinite integrals with u-sub.
 - definite integrals with u-sub.

- Section 6.5: More Integration Rules

- Rule for $\int e^{kx} dx$ and $\int \frac{1}{x} dx$

Material After Exam 3

- Section 6.3: Fundamental Theorem of calculus

- Evaluating a definite integral
 - * by hand if there are more than one variable.
 - * by the calculator.
- Interpretations of $\int_a^b f'(x) dx$
 - * The total change of the function $f(x)$ from $x = a$ to $x = b$.
 - * If $f(x)$ is above the x-axis, then this integral can represent area
- Find the area between $f(x)$ and the x-axis on an interval. Remember to check to see if the function is below the x-axis.

- Section 7.1

- Average value of $f(x)$ on the interval $[a, b]$
$$\frac{1}{b-a} \int_a^b f(x) dx$$
- word problems involving integrals. (see class problems for examples)

- Section 7.2: Area between curves

- Area between two functions on an interval. graph and look at which is on top and which is on bottom. (may have to use more than one integral to compute the area.)
- Area bounded by two functions.

- Section 7.3: Economic applications

- supply and demand function
- equilibrium point
- Consumers' surplus
- Producers' surplus

- Section 8.1: Functions of Several independent Variables

- evaluating and interpreting the answer.
- domain of the function.

- Section 8.3: Partial derivatives

- First partials
 - * computing
 - * evaluating at a point and interpreting the answers
- second partials

- Section 8.4: Maxima and Minima

- Finding critical values(points)
- Second derivative test to determine relative maximum, relative minimum or saddle point.

- Section 8.5: Lagrange Multipliers

- Any additional topics discussed in class