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<th>Learning Objectives/Testable Skills</th>
<th>Web Assign and Suggested Textbook Exercises *</th>
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| 1.1 MODELS AND FUNCTIONS | • Identify four representations of a function.  
• Specify input and output variables, input and output descriptions, and input and output units.  
• Draw an input/output diagram and a graph from a completely defined model.  
• Determine whether a relation is a function.  
• Write a sentence of interpretation from function notation.  
• Rewrite a sentence of interpretation using function notation.  
• Evaluate (find output) of an equation using a TI-84+ calculator.  
• Solve (find input) of an equation using a TI-84+ calculator.  
• Sketch a function graph on an interval | Pg. 8-12  
Web Assign (WA): 13, 19, 23, 31, 37, 39, 41  
(These textbook problems are the problems on Web Assign.)  
ADDITIONAL: 1, 2, 5, 7, 17, 21, 25, 27, 29, 33, 35, 43, 46, 47  
*Note: problems are subject to change. |
| 1.2: FUNCTION BEHAVIOR AND END BEHAVIOR LIMITS | • Determine the input interval on which a function is increasing, decreasing, or constant given a graphic representation of a function..  
• Determine the input interval on which a function is concave up, or concave down. given a graphic representation of a function.  
• Identify inflection point(s) visually from a graphic representation of a function.  
• Numerically estimate end behavior of a function given an algebraic representation of a function.  
• Use limit notation to describe end behavior of a function  
• Identify and write equation(s) of horizontal asymptotes. | Pg. 19-22  
WA: 9, 10, 13, 15, 21, 25  
ADD’L: 1, 3, 4, 11, 12, 16, 22, 25ab |
| 1.3: LIMITS AND CONTINUITY | • Visually determine continuity of a function.  
• Use right-hand and left-hand limits to determine continuity of a function.  
• Numerically estimate behavior of a function at a vertical asymptote.  
• Use limit notation to describe a vertical asymptote.  
• Identify and write the equation(s) of a vertical asymptote. | Pg. 30-31  
WA: 3, 5, 7, 13, 15  
ADD’L: 1,2,4,6,8, 11, 16 |
| 1.4 LINEAR FUNCTIONS AND MODELS | Find and interpret the rate of change (slope) of a linear model.  
  | Find and interpret the starting value of a linear model (y-intercept).  
  | Write a completely defined linear model given a starting value and a slope.  
  | Describe function behavior of a given linear function.  
  | Enter a data set into a TI-84+ calculator. Graph a scatter plot and fit a linear equation to the data.  
  | Write a completely defined model with four elements, from unaligned or aligned data.  
  | Differentiate between extrapolation and interpolation when using a model. Comment on the reliability of such predictions. | Pg. 42-45  
  | WA: 3, 7, 11, 13, 19, 23, 25  
  | ADD’L: 5, 21 |
| 1.5 EXPONENTIAL FUNCTIONS AND MODELS | Describe function behavior of an exponential function.  
  | Write a completely defined exponential model given a percentage change.  
  | Fit an exponential equation to a data set.  
  | Find and interpret the percentage change for an exponential model. | Pg. 53-56  
  | WA: 3, 5, 13, 15, 17, 21  
  | ADD’L: 11, 16, 19, 20 |
| 1.6 MODELS IN FINANCE | Use the compound interest formulas $A = P\left(1 + \frac{r}{n}\right)^{nt}$ and $A = Pe^{nt}$ to find future value.  
  | Use the compound interest formulas $A = P\left(1 + \frac{r}{n}\right)^{nt}$ and $A = Pe^{nt}$ to find present value.  
  | Find the APY (annual percentage yield, effective rate) with compounding n times per year or continuously  
  | Find and interpret the doubling time of an investment with compounding n times per year or continuously. | Pg. 64  
  | WA: 1, 3, 7, 9, 11  
  | ADD’L: none |
| 1.7 CONSTRUCTED FUNCTIONS | Construct new functions using addition, subtraction, multiplication, division, or composition. Use input and output units to justify the validity of the new function.  
  | Apply business terms to situations involving profit, revenue, cost, average cost, or the break-even point.  
  | Invert a data set and write and completely defined inverse model. | Pg. 72-75  
  | WA: 5, 7, 13, 21, 25, 27, 37  
  | ADD’L: 9, 11, 14, 15, 23 |
| 1.8 LOGARITHMIC FUNCTIONS AND MODELS | Describe function behavior of a logarithmic function.  
  | Recognize an inverse relationship between exponential and logarithmic functions.  
  | Fit a logarithmic equation to a data set. | Pg. 81 – 86  
  | WA: 3, 11, 17  
  | ADD’L: 1, 6, 7, 10, 14, 15 |
| 1.9 QUADRATIC FUNCTIONS AND MODELS | Describe function behavior of a quadratic function.  
  | Fit a quadratic equation to a data set and completely define the model.  
  | Differentiate between a quadratic, logarithmic, and exponential data set using end behavior. | Pg. 91 – 93  
  | WA: 3, 17, 19  
<p>| ADD’L: 18 |</p>
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| **1.10 LOGISTIC FUNCTIONS AND MODELS** | • Describe function behavior of a logistic function.  
  
  • Fit a logistic equation to a data set.  
  
  • Identify, and describe using limit notation, the upper limiting and lower limiting values (horizontal asymptotes) of a logistic function from an algebraic representation of a logistic function.  
  
  • Write the equations of the two horizontal asymptotes of a logistic function and interpret in context.  
  
  • Interpret the inflection point in the context of a model. | Pg. 98 – 102  
  
  WA: 3, 13, 17, 24  
  
  ADD’L: 5, 7, 9, 11, 16 |
| **1.11 CUBIC FUNCTIONS AND MODELS** | • Describe function behavior of a cubic function.  
  
  • Fit a cubic equation to a data set.  
  
  • Differentiate between a cubic and logistic data set using end behavior.  
  
  • Choose one of the six functions to model a set of data. Support the choice based on concavity and other features observed in a scatter plot. | Pg. 107 – 110  
  
  WA: 17, 21  
  
  ADD’L: 1, 5, 19 |
| **2.1 MEASURES OF CHANGE OVER AN INTERVAL** | • Find amount of change between two points, given the verbal, graphic, numeric, or algebraic representation of a function. Write a sentence of interpretation.  
  
  • Find percentage change between two points, given a verbal, graphic, numeric, or algebraic representation of a function. Write a sentence of interpretation.  
  
  • Find average rate of change between two points, given a verbal, graphic, numeric, or algebraic representation of a function. Write a sentence of interpretation.  
  
  • Relate the slope of the secant line drawn between two points on a graph to the average rate of change between two input values on the graph. | Pg. 134 – 138  
  
  WA:11, 13, 15, 17  
  
  ADD’L: 5, 9 |
| **2.2 MEASURES OF CHANGE AT A POINT - GRAPHICAL** | • Draw a tangent line to a graph using local linearity and the concavity of the graph.  
  
  • Draw a tangent line to a graph at an inflection point.  
  
  • Determine relative steepness of a tangent line and whether its slope is positive, negative, zero, or undefined.  
  
  • Relate the slope of a tangent line on a graph to the instantaneous rate of change at the input value on the graph.  
  
  • Estimate and write a sentence of interpretation for the slope of a tangent line to a graph.  
  
  • Explain how a tangent line is defined in terms of secant lines.  
  
  • Explain how the slope of a tangent line is defined in terms of the slope of secant lines and express this relationship mathematically.  
  
  • Find percentage rate of change between two points, given a verbal, graphic, numeric, or algebraic representation of a function. Write a sentence of interpretation. | Pg. 147 – 152  
  
  WA: 1, 9, 15, 25  
  
  ADD’L: 2, 3, 13, 14, 17, 20, 27 |
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| **2.3 RATES OF CHANGE – NOTATION AND INTERPRETATION** | • Recognize and use derivative notation(s)  
• Interpret derivatives in context.  
• Sketch a possible graph of a function given some information about specific points and derivatives at specific points.  
• Find and interpret a derivative at a specified point by drawing a tangent line on a graph. | Pg. 157 – 159  
WA: 1, 3, 5, 11  
ADD’L: 7, 13, 14, 18 |
| **2.4 RATES OF CHANGE – NUMERICAL LIMITS AND NONEXISTENCE** | • Estimate the derivative at a point using the numerical method.  
• Identify points at which the derivative does not exist due to discontinuity.  
• Identify points at which the derivative does not exist due to a vertical tangent. | Pg. 163 – 167  
WA: 3, 7, 13, 15, 20  
ADD’L: 1, 12, 16-18, 21 |
| **2.5 RATES OF CHANGE DEFINED OVER INTERVALS** | • Use the limit definition of the derivative (algebraic method) to find the derivative formula for a (linear or quadratic) function.  
• Find the derivative at a specific input value given a derivative formula. | Pg. 172 – 174  
WA: 9, 11, 13  
ADD’L: 1, 2, 16 |
| **2.6 RATE-OF-CHANGE GRAPHS** | • Identify intervals on the graph of a function on which the slope is zero, positive, or negative and use this information in drawing a slope graph.  
• Identify points on the graph of a function where the slope fails to exist or is undefined and use this information in drawing a slope graph.  
• Identify intervals on which a function is concave up or concave down and use this information in drawing a slope graph.  
• Locate points on a graph where the function is increasing or decreasing most or least rapidly and use this information in drawing a slope graph.  
• Sketch a slope graph for a continuous function on an interval.  
• Sketch a slope graph for a discontinuous function or for a continuous function with a sharp corner on an interval. | Pg. 180 – 184  
WA: 1, 4, 14, 25  
ADD’L: 2, 3, 6, 8, 10, 15, 22 |
| **3.1 SIMPLE RATE-OF-CHANGE FORMULAS** | • Use simple rate-of-change rules (constant rule, power rule, constant multiplier rule, sum/differences rule) to write derivative formulas.  
• Write a completely defined derivative model (roc model) given a function model.  
• Find the derivative at a specific input value using a TI-84+ calculator (nderiv). | Pg. 198 – 200  
WA: 5, 7, 11, 13, 15, 18, 21, 26, 27, 31, 33, 38  
ADD’L: 1-4, 6, 8, 9, 10, 12, 14, 16, 17, 19, 20, 22-25, 32 |
| **3.2 EXPONENTIAL AND LOGARITHMIC RATE-OF-CHANGE FORMULAS** | • Use the simple exponential and logarithmic differentiation rules to write derivative formulas. | Pg. 209 – 211  
WA: 3, 5, 11, 23  
ADD’L: 1, 7, 9, 13, 22, 29 |
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| 3.3 RATES OF CHANGE FOR FUNCTIONS THAT CAN BE COMPOSED | Use the chain rule (first form) to find the derivative formula of a composite function, given two functions represented algebraically.  
Use the chain rule (first form) to find the derivative of a composite function at a given input value, given appropriate values of two composable functions in words, equations, numbers, or in the context of a problem statement. | Pg. 216 – 219  
WA: 5, 7, 9, 13, 19, 23  
ADD’L: 1, 6 |
| 3.4 RATES OF CHANGE OF COMPOSITE FUNCTIONS | Use the chain rule (second form) to find the derivative formula for a single composition function.  
Identify an inside and an outside function of a composition function. | Pg. 223 -225  
WA:1, 3, 11, 15, 21, 27, 33, 37  
ADD’L: 5, 7, 9, 10,13,17, 19, 25, 28, 35, 38 |
| 3.5 RATES OF CHANGE FOR FUNCTIONS THAT CAN BE MULTIPLIED | Use the product rule to find the derivative formula of a product, given two functions represented algebraically.  
Use the product rule to find the derivative formula of \( f(x) \cdot g(x) \) at a given input value, when given values for \( f(x) \), \( f'(x) \), \( g(x) \), and \( g'(x) \) in words, equations, numbers, or in the context of a problem statement.  
Use Revenue = Price×Sales in problem solving. | Pg. 232 – 235  
WA: 1, 4, 7, 11, 15, 17, 23  
ADD’L: 3, 6, 17, 22 |
| 3.6 RATES OF CHANGE OF PRODUCT FUNCTIONS | Identify two functions as factors of a product function.  
Use the product rule to find the derivative formula of a single product function. | Pg. 237 – 239  
WA: 6, 9, 15, 16, 19, 25  
ADD’L: 1, 4, 7, 8, 12, 17, 20, 22 |
| 4.1 LINEARIZATION AND ESTIMATES | Use the slope of a tangent line to estimate the change in output between a point and a nearby point.  
Use point and a tangent line to estimate the value of the function at a nearby point. Use the concavity of the graph to predict whether the estimate will be “high” or “low”.  
Write the linearization of a function. | Pg. 254 – 257  
WA: 1, 3, 5, 7, 9, 13, 17  
ADD’L: 10, 15 |
| 4.2 RELATIVE EXTREME POINTS | Identify relative extreme points on a closed interval given either an equation or a graph.  
Sketch the graph of a function given characteristics of the function. | Pg. 264 – 266  
WA: 5, 9, 15, 25, 30  
ADD’L: 1-4, 7, 11, 12,17, 23, 27 |
| 4.3 ABSOLUTE EXTREME POINTS | Identify absolute extreme points on a closed interval given either an equation or a graph.  
Model a data set and find an absolute maximum or minimum (if it exists). | Pg. 271 – 273  
WA: 3, 9, 11, 13, 15  
ADD’L: 1, 2, 4, 5, 6 |
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<th>4.4 INFLECTION POINTS AND SECOND DERIVATIVES</th>
<th>4.5 MARGINAL ANALYSIS</th>
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<td>• Find inflection points for a continuous, smooth function on a closed interval.</td>
<td>• Find and interpret marginal revenue, cost, or profit at a point when given the derivative at that point or given the revenue, cost, or profit function.</td>
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<td>• Classify an inflection point as the point of most/least rapid increase/decrease.</td>
<td>• Find and use a model from a data set to interpret marginal values.</td>
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<tr>
<td>• Identify inflection points on a closed interval, and give an interpretation in context.</td>
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<td>• Discuss the relation between the second derivative, concavity, and inflection points for a smooth function on a closed interval.</td>
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<td>• Given a function ( f(x) ), sketch the graph of ( f(x), f'(x) ) and ( f''(x) ). Be able to discuss what the graphs of ( f'(x) ) and ( f''(x) ) tell you about the graph of ( f(x) ).</td>
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<td>• Determine a function graph from its derivative graph.</td>
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Pg. 280 – 283
WA: 6, 9, 13, 15, 19, 27
ADD’L: 2, 3, 4, 11, 20, 28, 31, 35, 37

Pg. 288 – 290
WA: 3, 7, 16, 17
ADD’L: 1, 9, 15