Exam 1 Review

February 15, 2018

The best way to study for this exam is to make sure you know the content below and that you feel confident about all of the problems on the worksheets/quizzes. You can expect questions/problems of similar difficulty to those. For additional practice problems, use the WebAssign homework, WebAssign quizzes, and the (many) problems at the end of each section in the book.

1. Understand all of the material in the review sections A.1, A.2, and A.6.

2. Sections 1.1, 1.4

    (a) Understand what a function is.

    (b) Know how to combine functions (add, subtract, multiply, divide, compose)

    (c) Know how to find the domain of all the functions discussed so far

    (d) Know how to find the domain of combinations of functions (adding, subtracting, multiplying, dividing, and composing)

    (e) Examples

        i. Find the domain of the following functions.
            A. $f(x) = \frac{\ln(x-1)}{x}$
            B. $f(x) = \frac{x^2+2x+1}{\sqrt{2x+4}}$
        ii. Rewrite each function as the composition of two simpler functions.
            A. $f(x) = \sqrt{2x^2 + 8}$
            B. $f(x) = \frac{5}{\ln(x)}$

3. Section 1.2

    (a) Understand **cost**, **revenue**, and **profit** and know how to find the equations for each one.

    (b) Know how to find the **break-even quantity**.

    (c) Understand **supply** and **demand**.

    (d) Know how to find the **equilibrium point**.

    (e) Know what the quadratic revenue function looks like and how to identify where the maximum occurs by looking at the graph.

4. Section 1.3

(a) Know the **compound interest formulas** (**continuous** and **non-continuous**).

(b) Know how to use these formulas to calculate what is asked (see relevant examples).

5. Section 1.5

   (a) Know the algebra rules for logs and how to use these rules to manipulate logs.

   (b) Know what the **natural log** $\ln(x)$ is and how it is used to solve for unknown variables in the continuous interest equation.

      i. Example: Suppose you deposit $1000 into an account that earns 3% interest compounded continuously. How long will it take for you to quadruple the money in your account?

6. Section 3.1

   (a) Know the **definition of a limit** and how to use it compute limits **graphically** and **algebraically** using limit laws. When does a limit exist? When does a limit not exist and why?

      i. Examples: See the examples we did in class and Worksheet 3.1 #1,5,6

   (b) Know what it means when a limit is $\pm\infty$ (i.e., **vertical asymptotes**). How do you show that there is a vertical asymptote at a point?

      i. Examples: See the examples we did in class and Worksheet 3.1 #3

   (c) Know the definition of a function being **continuous**.

      i. What are the 3 things required for a function to be continuous at a point?
      ii. If one of these fails, what kind of discontinuity do you get?
      iii. Know how to determine from a graph where a function is not continuous.
          A. Examples: See the example done in class. Try to do the same thing with Worksheet 3.1 #1. That is, at which points on the graph given in Worksheet 3.1 #1 is the function discontinuous?

7. Section 3.2

   (a) Know what the **average rate of change** is and how to calculate it given a function and interval. What does it represent (in english)?

   (b) Know what the **instantaneous rate of change** is and how to calculate it given a function and point. What does it represent (in english)?

8. Section 3.3

   (a) Know the **limit definition of the derivative** and how to use it to compute the derivative of a function.

   (b) Know what the derivative represents (slope of tangent line and instantaneous rate of change).

   (c) Know what it means for a function to be differentiable/not differentiable, i.e.:

      i. A function is differentiable at a point $x = a$ when the limit $f'(a) = \lim\limits_{h \to 0} \frac{f(a+h) - f(a)}{h}$ exists.

ii. A function fails to be differentiable at a point $x = a$ when the limit $f'(a) = \lim\limits_{h \to 0} \frac{f(a+h)-f(a)}{h}$ does not exist.

(d) In what situations do functions fail to be differentiable?

(e) Know how to determine from a graph where a function is not differentiable (see example done in class).

(f) Know how to sketch a graph of the derivative (see the sketch example and matching example done in class).

(g) Know how to interpret the derivatives of cost, revenue, and profit.