

# Learning Targets and Big Ideas

The number in brackets after each target indicates how many E's and/or M's are needed to master it.

## Mathematical Practice Learning Targets

### **I am an *independent and engaged* student who takes responsibility for my own learning. (Master 3/3)**

- IE.1: I take full advantage of opportunities to master the week's topics. This includes attending class, working with my group, coming to office hours, emailing with the instructor, and/or contributing on Piazza. [13]
- IE.2: I take responsibility for assignments by being the lead author. [6]
- IE.3: I attend to details (including all instructions) in my work. [12]

### **I can use different *representations and tools* to solve problems. (Master 2/3)**

- R.1: I can represent information using tables, graphs, diagrams, and equations and can translate among those representations to help me solve problems. [4]
- R.2: I can use technology to help me solve a difficult Calculus problem. [4]
- R.3: I can create a precise mathematical description of a problem that is given in real world terms, including identifying relevant variables, formulas, and creating helpful diagrams. [4]

### **I can *communicate* my ideas and solutions clearly and professionally. (Master 3/4)**

- C.1: I communicate my solutions in clear and well-organized writing that correctly incorporates mathematics. [6]
- C.2: I format mathematical formulas professionally in my writing. [6]
- C.3: I consistently label my answers with appropriate units. [6]
- C.4: I can create graphics that illustrate mathematical concepts and incorporate them in my writing. [2]

### **I *reason* clearly and can *critique* others' reasoning. (Master 2/2)**

- RC.1: I can write a convincing explanation of my work that clearly explains why it is correct and would convince a skeptic. [6]
- RC.2: I can accurately critique the reasoning of others, identify common misconceptions, and modify their work to produce a correct response. [2]

## Mathematical Content Learning Targets

### **I can use *functions* and other pre-Calculus mathematics proficiently. (Master 3/3)**

- F.1: I can read and use graphs and tables to gain relevant information within a problem. [6]
- F.2: I can use appropriate algebraic techniques and terminology to help me solve problems. [4]
- F.3: I can identify the fundamental algebraic structure of a function (product, composite, etc.). [2]

### **I can calculate, use, and explain the idea of *Limits*. (Master 3/4)**

- L.1: I can explain the meaning of a limit. [2]
- L.2: I can evaluate a limit graphically, numerically, and analytically (using algebra), including one-sided and infinite limits. [2]
- L.3: I can recognize points at which a function is (and is not) continuous, and can use continuity to evaluate limits. [2]
- L.4: I can identify limits in indeterminate form and can apply L'Hopital's rule correctly. [2]

**I understand the *meaning of the derivative*. (Master 6/7)**

- DM.1: I know the limit definition of the derivative and can explain the purpose of each symbol in the definition. [2]
- DM.2: I can calculate derivatives and estimates of derivatives using difference quotients (including average and instantaneous velocity) [4]
- DM.3: I can explain the connection between average and instantaneous rates of change, and can interpret them using secant and tangent lines and limits. [2]
- DM.4: I can find the tangent line to a function at a given point. [4]
- DM.5: I can recognize points at which a function is (and is not) differentiable, and can use the definition or interpretation of the derivative to support my thinking. [2]
- DM.6: I can use tangent lines to approximate function values and roots. [2]
- DM.7: I use derivative notation correctly (such as  $f'(x)$  and  $\frac{dy}{dx}$ ) [4]

**I can use *shortcuts to calculate derivatives efficiently*. (Master 4/4)**

- DS.1: I can compute derivatives correctly for sums, constant multiples, and power, polynomial, trig, exponential, logarithmic, and inverse trigonometric functions. [6]
- DS.2: I can compute derivatives correctly using the product, quotient, and chain rules. [4]
- DS.3: I can compute derivatives correctly using multiple rules in combination. [2]
- DS.4: I can compute derivatives correctly using implicit differentiation. [2]

**I can use derivatives to understand and solve genuine *applications*. (Master 5/6)**

- DA.1: I can correctly interpret the meaning of a derivative in context. [8]
- DA.2: I can use calculus to find relative and absolute extrema and points of inflection of functions. [4]
- DA.3: I can recognize and explain the relationships among the behaviors of  $f$ ,  $f'$ , and  $f''$ , including slopes, rates of change, and concavity. [6]
- DA.4: I can use the information provided by  $f$ ,  $f'$ , and/or  $f''$  to identify and draw accurate graphs of the other functions. [4]
- DA.5: I can solve related rates problems completely and correctly. [2]
- DA.6: I can solve optimization problems completely and correctly. [2]

**I can calculate totals and sums using the *Fundamental Theorem of Calculus*. (Master 3/4)**

- FTC.1: I can calculate the area between curves, net change, and displacement using Riemann sums and the Fundamental Theorem of Calculus. [2]
- FTC.2: I can explain the meaning of the Fundamental Theorem of Calculus, definite integrals, and Riemann sums in terms of a graph, and interpret them using the idea of rates of change, net change, and displacement. [2]
- FTC.3: I can write and recognize a definite integral as the limit of a Riemann sum. [2]
- FTC.4: I can correctly anti-differentiate basic functions and identify antiderivatives. [2]

**If you are confused or worried about your grade or our grading system, see me immediately.** I'll be glad to discuss it with you. *Talk to me as soon as you feel that you are falling behind.* While it is important to *eventually* demonstrate mastery, keep in mind that the class must eventually end, and so you will eventually run out of opportunities.