Math 122 (Section 9) **Exam 3 covers 3.3, 3.5, 5.1–5.4**

Sections 3.3 and 3.5

- Given a formula for some function, be able to compute a definite integral of that function on your calculator.
- Set up (and possibly evaluate) the definite integral (or integrals) needed to compute an area between two curves (one of these curves may just be the x-axis). (look at #3,4,11–15 in section 3.3)
- Given a graph of a function, be able to approximate (or find exactly if you see the area of basic shapes like triangles or rectangles) a definite integral of that function. Remember that the definite integral of a function gives the "signed area" between the graph of that function and the x-axis. (look at #1,2,6,19 in section 3.3)
- Given the rate at which some quantity is changing, be able to compute the total change in that quantity. (look at #5–9,14 in section 3.5)

Sections 5.1–5.4

- Given a formula for a function, be able to find a formula for the derivative of that function. In particular, if n, m, b, c, and a are constants ($a > 0$), then

  1. $\dfrac{d}{dx}\Big(x^n\Big) = nx^{n-1}$
  2. $\dfrac{d}{dx}\Big(\ln x\Big) = \dfrac{1}{x}$
  3. $\dfrac{d}{dx}\Big(a^x\Big) = \ln a \cdot a^x$
  4. $\dfrac{d}{dx}\Big(c\Big) = 0$
  5. $\dfrac{d}{dx}\Big(mx + b\Big) = m$
  6. $\dfrac{d}{dx}\Big(e^x\Big) = e^x$
  7. $\dfrac{d}{dx}\Big(f(x) \pm g(x)\Big) = f'(x) \pm g'(x)$
  8. $\dfrac{d}{dx}\Big(cf(x)\Big) = cf'(x)$
  9. **Chain Rule:** $\dfrac{d}{dx}\Big(f(g(x))\Big) = f'(g(x)) \cdot g'(x)$ $\qquad \left(\text{ also written as } \dfrac{dy}{dx} = \dfrac{dy}{du} \cdot \dfrac{du}{dx}\right)$
  10. **Product Rule:** $\dfrac{d}{dx}\Big(f(x) \cdot g(x)\Big) = f'(x) \cdot g(x) + f(x) \cdot g'(x)$

  Note that rules 4 and 5 are really just special cases of rule 1. Also rule 6 is just a special case of rule 3 since $\ln e = 1$.

- Know what the derivative means (looking at chapter 2 and your old exams may help), and know how to apply this to problems like the following:

  1. Given a formula for some quantity, find the rate at which that quantity is changing.
  2. Sketch the graph of $f(x) =$ *some formula*. Find the slope of this curve at any given point. Also be able to sketch the tangent line at any particular point and find the equation of that tangent line.
  3. The cost (or revenue) function for some item is given by *some formula*. Find a formula for the marginal cost (or revenue). For a particular value of q, explain what this means in practical terms.
  4. The position of an object is given by *some formula*. Find a formula for the velocity of that object. Use this to answer questions like #43 in section 5.1.