

## Exam 1 Review

Focus your study on the homework and quiz problems. Exam problems will be *similar (though not identical) in all cases* to problems you've seen. Some things to keep in mind as you study:

1. The most important action you can take to be successful on the exam is to **work lots of problems without the aid of written solutions**. This will point out your weaknesses and get you used to exam-like conditions.
2. Don't try to memorize the step-by-step process for solving particular problems, rather learn the basic methods and work hard on developing your calculus and algebra fundamentals (which doesn't happen when you follow the solutions closely).
3. You will need to know some or all of the following basic derivative formulas:

$$\begin{aligned}\frac{d}{dx} [e^{u(x)}] &= \frac{d}{dx} [u(x)] e^{u(x)}, \\ \frac{d}{dx} [\ln(u(x))] &= \frac{1}{u(x)} \frac{d}{dx} [u(x)], \\ \frac{d}{dx} [u(x)^a] &= a u(x)^{a-1} \frac{d}{dx} [u(x)], \\ \frac{d}{dx} [u(x)v(x)] &= \frac{d}{dx} [u(x)]v(x) + u(x) \frac{d}{dx} [v(x)], \\ \frac{d}{dx} \left[ \frac{u(x)}{v(x)} \right] &= \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} (x)\end{aligned}$$

4. You will need to be able to compute integrals of the following form (note that  $x$  here can be replaced by some other variable like  $y, z$ , etc.):

$$\int \frac{c dx}{x}, \quad \int \frac{c dx}{ax+b}, \quad \int c x^r dx, \quad \int c(ax+b)^r dx, \quad \int c e^{ax+b} dx, \quad \int c x e^{ax^2+b} dx,$$

where  $a, b, c, r$  any numbers with  $a \neq 0$  and  $r \neq -1$ .

5. You will be given the following integral formulas if the corresponding integrals come up:

$$\begin{aligned}\int x e^{ax} dx &= \frac{e^{ax}}{a} \left( x - \frac{1}{a} \right) + C, \quad a \neq 0, \\ \int e^{ax} \sin bx dx &= \frac{e^{ax}}{a^2 + b^2} (a \sin bx - b \cos bx) + C, \quad a, b \neq 0, \\ \int e^{ax} \cos bx dx &= \frac{e^{ax}}{a^2 + b^2} (a \cos bx + b \sin bx) + C, \quad a, b \neq 0.\end{aligned}$$

Recall that the last two integral formulas were needed in the electrical circuit problems, and the first one was needed in the *integration factor method* homework.