

Welcome to Math 185, Calculus II. In this course you will learn new techniques of integration, further solidify the relationship between differentiation and integration, and be introduced to a variety of new functions and how to use the concepts of calculus with those new functions. In addition, we will study many interesting applications of calculus to further our understanding of real-world phenomena.

In first-semester calculus (regardless of where you took it) you learned the basic facts and concepts of calculus. To insure your continued success in second-semester, it is important that you are able to recall and use the following facts without struggling.

Derivative Formulas You MUST Know

$$\begin{array}{lll} \frac{d}{dx} [c] = 0 & \frac{d}{dx} [c \cdot f(x)] = c \cdot f'(x) & \frac{d}{dx} [f(x) \pm g(x)] = f'(x) \pm g'(x) \\ \frac{d}{dx} [f(x) \cdot g(x)] = f(x) \cdot g'(x) + g(x) \cdot f'(x) & \frac{d}{dx} \left[\frac{f(x)}{g(x)} \right] = \frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{[g(x)]^2} & \frac{d}{dx} [x^n] = n \cdot x^{n-1} \\ \frac{d}{dx} [f(g(x))] = f'(g(x)) \cdot g'(x) & \frac{d}{dx} [e^{g(x)}] = e^{g(x)} \cdot g'(x) & \frac{d}{dx} [\ln [g(x)]] = \frac{1}{g(x)} \cdot g'(x) \\ \frac{d}{dx} [\sin(x)] = \cos(x) & \frac{d}{dx} [\tan(x)] = \sec^2(x) & \frac{d}{dx} [\sec(x)] = \sec(x) \tan(x) \\ \frac{d}{dx} [\cos(x)] = -\sin(x) & \frac{d}{dx} [\cot(x)] = -\csc^2(x) & \frac{d}{dx} [\csc(x)] = -\csc(x) \cot(x) \\ \frac{d}{dx} [\sin^{-1}(x)] = \frac{1}{\sqrt{1-x^2}} & \frac{d}{dx} [\tan^{-1}(x)] = \frac{1}{1+x^2} & \frac{d}{dx} [\sec^{-1}(x)] = \frac{1}{|x|\sqrt{x^2-1}} \end{array}$$

Be sure you know *where* to find the deriv's of the other inverse trig fun's.

$$\begin{array}{lll} \frac{d}{dx} [a^x] = a^x \ln(a) & \frac{d}{dx} [\ln |x|] = \frac{1}{x}, x \neq 0 & \frac{d}{dx} [\log_a(x)] = \frac{1}{x \ln(a)} \\ \frac{d}{dx} [\sinh(x)] = \cosh(x) & \frac{d}{dx} [\cosh(x)] = \sinh(x) & \frac{d}{dx} [\tanh(x)] = \operatorname{sech}^2(x) \end{array}$$

Be sure you know *where* to find the deriv's of the other hyperbolic fun's.

$$\frac{d}{dx} [\sinh^{-1}(x)] = \frac{1}{\sqrt{1+x^2}} \quad \frac{d}{dx} [\cosh^{-1}(x)] = \frac{1}{\sqrt{x^2-1}} \quad \frac{d}{dx} [\tanh^{-1}(x)] = \frac{1}{1-x^2}$$

Be sure you know *where* to find the deriv's of the other inverse hyperbolic fun's.

Integral Formulas You MUST Know

$$\int_a^b f(x) \, dx = F(b) - F(a), \text{ where } F'(x) = f(x)$$

$$\begin{array}{lll} \int x^n \, dx = \frac{x^{n+1}}{n+1} + C, n \neq -1 & \int \frac{1}{x} \, dx = \ln |x| + C & \int e^x \, dx = e^x + C \\ \int \cos(x) \, dx = \sin(x) + C & \int \sin(x) \, dx = -\cos(x) + C & \int \tan(x) \, dx = \ln |\sec(x)| + C \\ \int \sec(x) \, dx = \ln |\sec(x) + \tan(x)| + C & \int \csc(x) \, dx = \ln |\csc(x) - \cot(x)| + C & \int \cot(x) \, dx = \ln |\sin(x)| + C \\ \int \sec^2(x) \, dx = \tan(x) + C & \int \csc^2(x) \, dx = -\cot(x) + C & \int \sec(x) \tan(x) \, dx = \sec(x) + C \\ \int \csc(x) \cot(x) \, dx = -\csc(x) + C & \int \frac{1}{a^2+x^2} \, dx = \frac{1}{a} \tan^{-1} \left(\frac{x}{a} \right) + C & \int \frac{1}{\sqrt{a^2-x^2}} \, dx = \sin^{-1} \left(\frac{x}{a} \right) + C \end{array}$$

I recommend that you make flash cards of these basic facts, and review them whenever you have a free moment. (I always kept my cards in the car with me and reviewed them while waiting for red lights to turn green.)