Section 4.1 (Antiderivatives and Indefinite Integration)

One goal in antiderivatives is to find a function F(x) that has a given derivative. Consider the function whose derivative is $4x^3$. The function with this derivative is …

F(x) = __________ because $\frac{d}{dx}$ [__________]=$4x^3$

A function F is an ***antiderivative*** of f on an interval I when F`(x) = f(x) for all x in I

Example: Find the general solution to the *differential equation* (definition before example 1 in book) y` = 3.

(Hint: Find a function whose derivative is 3. The operation of finding all solutions of this equation is called antidifferentiation)

Integration is the inverse of differentiation (and vice versa): $\int F\,`(x)dx = F(x) + C$ and $\frac{d}{dx}[\int f(x)dx] = f(x)$

Examples: Review basic integration rules in the book (p. 246) and find the following antiderivatives

(Hint: rewrite -> integrate -> simplify)

$\int 5x\,dx$ $\int \frac{1}{x^2}\,dx$ $\int (2x+3)\,dx$ $\int \sqrt{x}\,dx$ $\int 5\cos(x)\,dx$ $\int (5x^3+2x^2-7)\,dx$

$\int \frac{1-x}{\sqrt{x}}\,dx$ $\int \frac{\cos x}{\sin^2 x}\,dx$ Other homework examples as time allows

We've seen how to find the general solutions for antiderivatives, but if given an initial condition, we can find a particular solution.

Example: Find the general solution to F`(x) = $\frac{1}{x^2}$, x > 0 and then find the particular solution that satisfies f(1) = 2.

Example: Virginia Tech pitcher Aaron McGarity is near the top of beautiful Lane Stadium at an initial height of 96 feet when he throws a ball upward with an initial velocity of ~55 mph (80 feet per second). (a) Find the position function giving the height s as a function of time t. (b) When does the ball hit the ground?

Homework problems: 1,4,7,8,11,14,15,17,20,21,25,35,36,39,51,57 (required) 52,56,60 (recommended)