Sec 4.7 Anti Derivatives

A function $F(x)$ is called the anti-derivative of $f(x)$ if $F'(x) = f(x)$

Basic rules of anti differentiation

In general: Reverse basic rules of differentiation.

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C, \text{ when } n \neq -1$$

$$\int e^x\,dx = e^x + C$$

$$\int a^x\,dx = \frac{a^x}{\ln a} + C$$

$$\int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int \frac{1}{1+x^2}\,dx = \arctan x + C$$

$$\int \frac{1}{\sqrt{1-x^2}}\,dx = \arcsin x + C$$

$$\int \cos x\,dx = \sin x + C$$

$$\int \sin x\,dx = -\cos x + C$$

$$\int \sec^2 x\,dx = \tan x + C$$

$$\int \csc^2 x\,dx = -\cot x + C$$

$$\int \sec x \tan x\,dx = \sec x + C$$

$$\int \csc x \cot x\,dx = -\csc x + C$$

Important: **Always use proper notation!*
**Don't forget +C*

Examples: Find the anti derivative for each of the following:

1.) $f(x) = 2x^3 - 7x^2 + 7x - 7$

2.) $g(x) = 6x^{\frac{1}{5}} - 18x^{\frac{4}{5}}$

3.) $h(x)=\sqrt[7]{x^2}+\frac{2}{x^5}+\frac{1}{x}$

4.) $k(x)=\frac{x^4+8\sqrt{x}}{x^2}$

5.) $m(x)=10\sin x+6\cos x$.

6.) $k(x)=\frac{8}{1+x^2}$

7.) $k(x)=\frac{2}{\sqrt{1-x^2}}$

8.) Find the function $F(x)$ given that $f(x) = 2x^7 - 4x^3$ and $F(0) = 19$

9.) Find the function $f(x)$ given that $f''(x) = 24x^2 + 10$, $f(0) = 5$ and $f'(1) = 2$

10.) A particle is moving with acceleration $a(t) = 12t + 2$. Its position at time $t = 0$ is $s(0) = 11$ and its velocity at time $t = 0$ is $v(0) = 9$. What is its position at time $t = 6$?