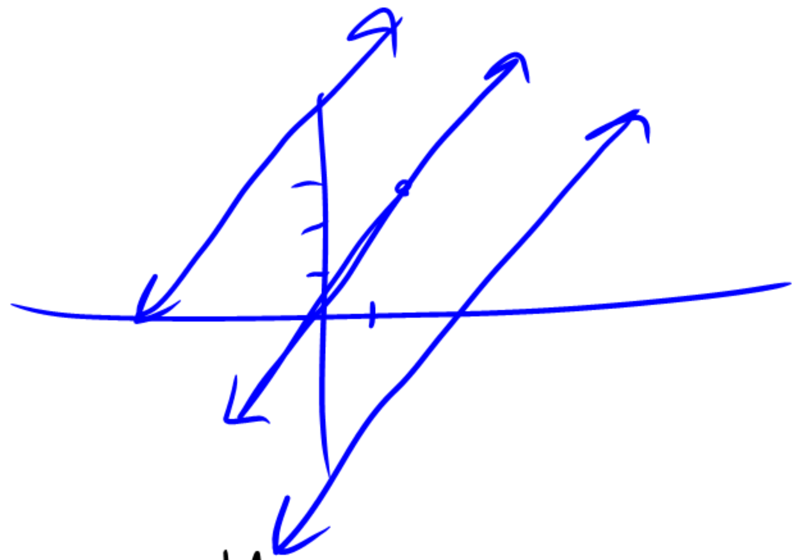
4.1 Antiderivatives

$y = 3x + 2$

so $y' = 3 + 0$

$\boxed{y' = 3}$ → the slope of the graph is 3



$F(x) = 3x$ or $F(x) = 3x - 25$

$F(x) = 3x + C$

$F'(x) = 3$

$$y' = x^2$$

$$\frac{dy}{dx} = x^2$$

$$\int dy = \int x^2 dx$$

$$\int y^0 dy = \int x^2 dx$$

$$\frac{y^1}{1} = \frac{x^3}{3} + C \longrightarrow \boxed{y = \frac{x^3}{3} + C}$$

$$f(x) = \boxed{} x^3$$

$$f'(x) = 3x^{3-1}$$

$$= 3x^2$$

$y = \sec x \tan x + C$

answered this: $y' = \sec x$

$\frac{\partial}{\partial x}[C] = 0$ $\qquad$ $\int 0\,dx = C$

$\frac{\partial}{\partial x}[kx] = k$ $\qquad$ $\int k\,dx = kx + C$

$\int 5\,dx = 5x + C$

$\frac{\partial}{\partial x}[kf(x)] = kf'(x)$ $\qquad$ $\int kf(x)\,dx = k\int f(x)\,dx$

$\int 2x^2\,dx = 2\int x^2\,dx$

$$\frac{\partial}{\partial x}\left[f(x) \pm g(x)\right] = f'(x) \pm g'(x)$$

$$\int \left[f(x) \pm g(x)\right] dx = \int f(x)\,dx \pm \int g(x)\,dx$$

$$\int (x-8)\,dx = \int x\,dx - \int 8\,dx$$

$$= \frac{x^2}{2} - 8x + C$$

$$\frac{\partial}{\partial x}\left[x^n\right] = n x^{n-1}$$

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

$$\int x^{2/3}\,dx = \frac{x^{2/3+1}}{2/3+1} + C = \boxed{\frac{3x^{5/3}}{5} + C}$$

$n \neq -1$

$\int x^{-1}\,dx = 1$

not true

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

Chapter 5 stuff

$\frac{d}{dx} \sin x = \cos x$

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

*very useful formula $\Rightarrow$ power reducing formula for the sine and cosine functions

$$\cos^2 x = \frac{1+\cos 2x}{2} = \frac{1}{2} + \frac{1}{2}\cos 2x$$

$$\sin^2 x = \frac{1-\cos 2x}{2} = \frac{1}{2} - \frac{1}{2}\cos 2x$$

$$\frac{d}{dx}\cos x = -\sin x \qquad \int \sin x\,dx = -\cos x + C$$

$$\frac{d}{dx}\tan x = \sec^2 x \qquad \int \sec^2 x\,dx = \tan x + C$$

$$\frac{d}{dx}\cot x = -\csc^2 x \qquad \int \csc^2 x\,dx = -\cot x + C$$

$$\frac{d}{dx}\sec x = \sec x \tan x \qquad \int \sec x \tan x\,dx = \sec x + C$$

$$\frac{d}{dx}\csc x = -\csc x \cot x \qquad \int \csc x \cot x = -\csc x + C$$

Question

$$\frac{d}{dx}(\cos 2x) = (-\sin 2x)\cdot 2$$

$$= -2\sin 2x$$

$$\int a(t)\,dt = \int -9.8\,dt$$

$$\int v(t)\,dt = \int (-9.8t + C)\,dt$$

$$s(t) = \frac{-9.8t^2}{2} + C_1 t + C_2$$

$$s(t) = -4.9t^2 + v_0 t + S_0$$

$S_0 = 1800$

$v_0 = 0$

$s(t) = 0$

$0 = -4.9t^2 + 1800$

$4.9t^2 = 1800$

$\sqrt{t^2} = \sqrt{367.35}$

$t = 19.2$ sec.

Practice Integrals

(1) $\int dx = \int x^0 dx = \frac{x^{0+1}}{0+1} + C = \boxed{x + C}$

(2) $\int -5 \sec x \tan x \, dx$

$= \boxed{-5\sec x + C}$

Side note: $\frac{d}{\cancel{dx}} x \, \cancel{dx}$

dx

(3) $\int \frac{dx}{\cos^2 x} = \int \sec^2 x \, dx$

$= \boxed{\tan x + C}$

(4) $\int \frac{5\sqrt{t} - 8t + t^2}{t} dt = \int (5t^{-1/2} - 8t^0 + t) dt$

$t^{1/2 - 1}$

$= \frac{5t^{-1/2+1}}{-1/2+1} - \frac{8t^1}{1} + \frac{t^{1+1}}{1+1} + C$

$$= \frac{5t^{1/2}}{1/2} - 8t + \frac{t^2}{2} + C$$

$$= \boxed{10\sqrt{t} - 8t + \frac{t^2}{2} + C}$$

4.2 Area

$$\sum_{i=1}^{4} \frac{1}{i} = \underset{a_1}{\frac{1}{1}} + \underset{a_2}{\frac{1}{2}} + \underset{a_3}{\frac{1}{3}} + \underset{a_4}{\frac{1}{4}} = \boxed{\frac{25}{12}}$$