calc

- Passage of the DAY
- Pass HW back  Calc II turn HW in
- Calc 1  Start working on Rs

Note §1.7 R1 corresponds to §1.1

Calc 2 HW §2.2 #'1-3,5

Calc II

§2.2 / Theorem 2.1

Says there exists a unique solution to

$$y' + p(x)y = g(x)$$

and it is in the form

$$y = \frac{1}{\mu(x)}\left[\int^x \mu(s)g(s)\,ds + c\right]$$ Yuck

where $\mu(x) = e^{\int^x p(t)\,dt}$

Recall product rule

$y' + p(x)y$ look like $\frac{d}{dx}(\mu(x)y)$

Steps to solving $y' + p(x)y = g(x)$

i) Get linear DE in that form

ii) Set $\mu(x) = e^{\int^x p(t)\,dt}$

iii) Mult equation by $\mu(x)$. Recognize the product rule

iv) Integrate

② 

$$x^2 y' + 3xy = \frac{\sin x}{x}$$

$\div x^2)$

$$y' + \underbrace{\frac{3}{x}}_{p(x)} y = \frac{\sin x}{x^3} \qquad e^{\ln x^3}$$

Let $\mu(x) = e^{\int^x \frac{3}{t}dt} = e^{3\ln x} = x^3$

$$x^3 y' + 3x^2 y = \sin x$$

$$\frac{d}{dx}(x^3 y) = (x^3 y)' = \sin x$$

$$x^3 y = \int \sin x \, dx$$

$$y = \frac{-\cos x + C}{x^3}$$

Recall

IBP $\int u\,dv = uv - \int v\,du$

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

Let $u = x$ $\quad dv = \sin x\,dx$

$\Rightarrow du = dx$ $\quad v = -\cos x$