$$\sum_{n=0}^{\infty} \frac{1}{2^n}(x+3)^n$$

$$\lim_{n\to\infty} \sqrt[n]{\left|\frac{1}{2^n}(x+3)^n\right|} = \lim_{n\to\infty} \sqrt[n]{\frac{1}{2^n}|x+3|^n}$$

$$= \lim_{n\to\infty} \frac{1}{2}|x+3| = \frac{1}{2}|x+3|$$

$$\frac{1}{2}|x+3| < 1$$

$$|x-\underbrace{(-3)}_{c}| < \underbrace{2}_{RoC}$$

$$|x-c| < R$$

IOC is $(-5,-1)$

$$\sum_{n=0}^{\infty} \frac{1}{2^n}(x+3)^n \qquad \text{IOC } (-5,-1)$$

$$\lim_{n\to\infty} \frac{\left|\frac{1}{2^{n+1}}(x+3)^{n+1}\right|}{\left|\frac{1}{2^n}(x+3)^n\right|} = \lim_{n\to\infty} \frac{1}{2}|x+3| \text{ etc.}$$

$x=-5$: $\displaystyle\sum_{n=0}^{\infty} \frac{1}{2^n}(-2)^n = \sum_{n=0}^{\infty}(-1)^n$ doesn't converge
nth term

$x=-1$: $\displaystyle\sum_{n=0}^{\infty} \frac{1}{2^n}(2^n) = \sum_{n=0}^{\infty} 1$ diverges

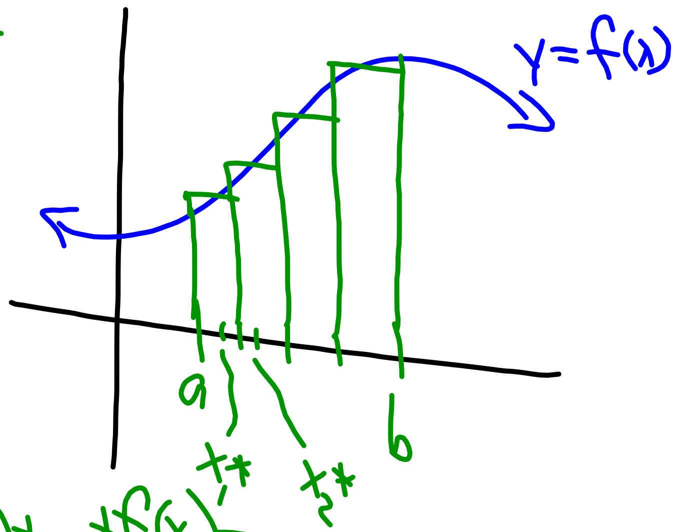
so IOC is just $(-5,-1)$

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

antiderivative $F(x)$

When no $F$, use a numerical method.

$$\text{Area} \approx \underbrace{\sum f(x_k^*)\Delta x_k}_{A = \ell w}$$




$$\text{Area} \approx \sum_{k=1}^{n} f(x_k)\Delta x$$

$$= n\Delta x \frac{\sum f(x_k)}{n}$$

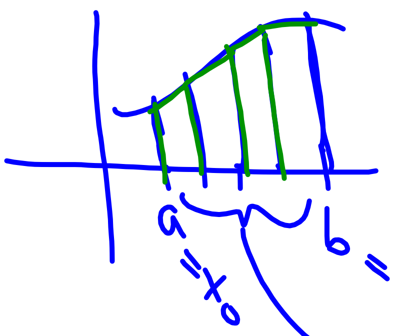
$$= (b-a)\left[\frac{f(x_1)+f(x_2)+\dots+f(x_n)}{n}\right]$$

$$= (b-a)\left[\frac{1}{n}f(x_1)+\frac{1}{n}f(x_2)+\dots+\frac{1}{n}f(x_n)\right]$$

$$\int_a^b f(x)\,dx \approx (b-a)\left[\frac{1}{2n}f(x_0)+\frac{1}{n}f(x_1)+\dots+\frac{1}{n}f(x_{n-1})+\frac{1}{2n}f(x_n)\right]$$

$\frac{1}{2}\left(\frac{1}{n}\right)$

$\frac{1}{2n}$




n subintervals

$$\frac{1}{n}(n-1)+\frac{1}{2n}(2)$$

$$\frac{n-1}{n}+\frac{1}{n}=1$$

20% HW 87%

30% lab 92%

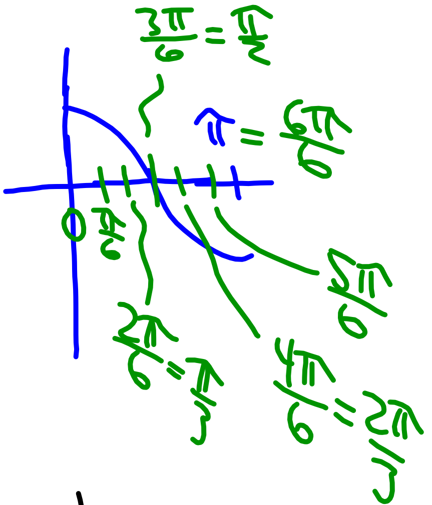
50% exams 83%

$$\underline{\underline{0.20}}(87)+\underline{\underline{0.30}}(92)+\underline{\underline{0.50}}(83)$$

$\int_0^{\pi} \cos x\,dx$, Simpson's, $\underline{\underline{n=6}}$

Cut $[0,\pi]$ into 6 subintervals

$\Delta x = \frac{b-a}{n} = \frac{\pi}{6}$

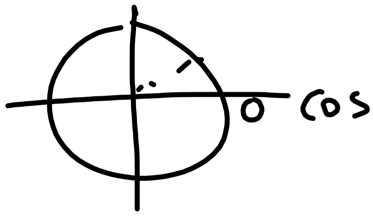



$x_0 = 0$

$x_1 = \frac{\pi}{6}$

$x_2 = \frac{\pi}{3}$

$\vdots$




$$\int_a^b \cos x\,dx = \left(\frac{\pi - 0}{3(6)}\right)\Big[\cos(0) + 4\cos\frac{\pi}{6} + 2\cos\frac{\pi}{3} + 4\cos\frac{\pi}{2} + 2\cos\frac{2\pi}{3} + 4\cos\frac{5\pi}{6} + \cos\pi\Big]$$

$$= \frac{\pi}{18}\Big[1 + 4\left(\frac{\sqrt{3}}{2}\right) + 2\left(\frac{1}{2}\right) + 4(0) + 2\left(-\frac{1}{2}\right) \qquad \Big]$$

$$\int_0^{\pi} \underbrace{\sin x}\, dx = \int_0^{\pi} \left( x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots \right) dx$$

$$= \int_0^{\pi} x\,dx - \int_0^{\pi} \frac{x^3}{3!}\,dx + \int_0^{\pi} \frac{x^5}{5!}\,dx + \cdots$$