$$A = P(1+i)^n = P\left(1+\frac{r}{m}\right)^{mt}$$

Annuity

1 R

2 $R\left(1+\frac{r}{m}\right) + R$

3 $\left(R\left(1+\frac{r}{m}\right)+R\right) + R\left(1+\frac{r}{m}\right)i + R$

$= R\left(1+\frac{r}{m}\right)\left(1+\frac{r}{m}\right) + R$

$= R\left(1+\frac{r}{m}\right)^2 + R$

4 $R\left(1+\frac{r}{m}\right)^3 + R$

5 $R\left(1+\frac{r}{m}\right)^4 + R$

⋮

n $R\left(1+\frac{r}{m}\right)^{n-1} + R = R\left(\left(1+\frac{r}{m}\right)^{n-1}+1\right)$

R_1

$R_1 + R_1 i + R$

$R_2 + R_2 i + R$

$R_k = R_{k-1} + R_{k-1} i + R$

§7.7 Approximate Integrals
20 pt project for Test 2.

$$\int_1^2 \frac{1}{x^2}\,dx$$

Riemann Sum

$$\Delta x = \frac{b-a}{n} = \frac{2-1}{n} = \frac{1}{n} = \frac{1}{20}$$

$n = 5, 10, 20$

$$x_k = a + k\Delta x = 1 + k\frac{1}{20} = \frac{20+k}{20}$$

$$f(x_k) = \frac{1}{\left(\frac{20+k}{20}\right)^2}$$

$$x_k = a + k\Delta x = a + k\cdot\frac{1}{n} = \frac{an+k}{n}$$

$$\text{Area} \approx \sum_{k=1}^{20} f(x_k)\Delta x$$

$n =$ $a = 1, 50$

$$= \sum_{k=1}^{20}\left(\left(\frac{1}{\left(\frac{20+k}{20}\right)^2}\right)\left(\frac{1}{20}\right)\right)$$

$$f(x_k) = \frac{1}{\left(\frac{n+k}{n}\right)^2} = \frac{n^2}{(n+k)^2}$$

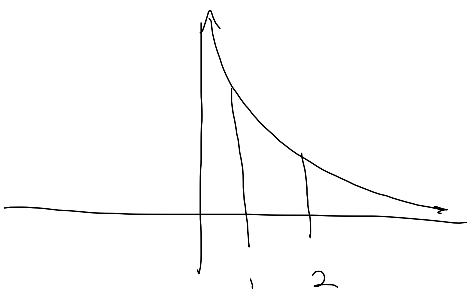
$$f(n,k) = \sum_{k=1}^{n}\left(\left(\frac{1}{\left(\frac{20+k}{n}\right)^2}\right)\left(\frac{1}{n}\right)\right)$$

so $f(x_k)\Delta x$

$$= \frac{n^2}{(n+k)^2}\cdot\frac{1}{n} = \frac{n}{(n+k)^2}$$

$$\frac{n^2}{(20+k)^2}\cdot\frac{1}{n} = \frac{n}{(20+k)^2}$$

$$\sum_{k=1}^{n} \frac{n}{(n+k)^2}$$



$$\int_1^2 \frac{dx}{x^2} = \int_1^2 x^{-2}\,dx$$

$$= -x^{-1}\Big]_1^2 = -\frac{1}{x}\Big]_1^2$$

$$= -\frac{1}{2} - \left(-\frac{1}{1}\right) = \frac{1}{2}$$

$$\int_1^2 e^{\frac{1}{x}}\,dx$$

$$\Delta x = \frac{1}{n} \quad , \quad x_k = 1 + k \cdot \frac{1}{n} = \frac{n+k}{n}$$

$$f(x_k) = e^{\frac{1}{\frac{n+k}{n}}}$$

$$\text{Area} \approx \sum_{k=1}^{n} \left(\exp\left(\frac{n}{n+k}\right) \cdot \frac{1}{n} \right) = \sum f(x_k)\Delta x$$

Does $\int_0^\infty e^{-x^2}dx$ converge?

$$\int_0^\infty e^{-x}dx = \lim_{t\to\infty} -e^{-x}\Big]_0^t$$

$$= \lim_{t\to\infty} -e^{-t} - (-e^{-0})$$

$$= 0 + 1 \text{ converges,}$$

$$\boxed{\int_0^1} + \int_1^\infty$$

$x^2 \le x$

$x^2 \ge x \Rightarrow$

$$-x^2 \le -x$$

$$e^{-x^2} \le e^{-x}$$

e^y is increasing function of y

$\therefore \int_1^\infty e^{-x^2}dx \le \int_1^\infty e^{-x}dx$

$\int_a^b$ cnts $\in \mathbb{R}$

$\int_a^\infty$ cnts we're not sure.

$$\int_1^{\infty} \frac{e^{-\sqrt{x}}}{\sqrt{x}}\,dx$$

$$u = -x^{\frac{1}{2}}$$

$$du = -\frac{1}{2}x^{-\frac{1}{2}} = -\frac{1}{2\sqrt{x}}$$

$$= -2\int_1^{\infty} e^{u}\left(-\frac{1}{2\sqrt{x}}\right)dx = -2\int_{1=x}^{\infty=x} e^{u}\,du$$

$$\lim_{t\to\infty} -2\int_{x=1}^{t=x} e^{u}\,du = \lim_{t\to\infty} -2\left[e^{u}\right]_{1=x}^{t=x}$$

$$\lim_{t\to\infty} -2\left[e^{-\sqrt{x}}\right]_{x=1}^{x=t} = \lim_{t\to\infty} -2\left[e^{-\sqrt{t}} - e^{-\sqrt{1}}\right]$$

$$= -2\left[0 - \frac{1}{e}\right] = \frac{2}{e}$$