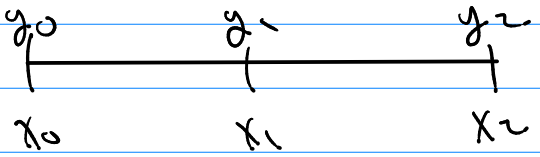
Math 451

Q's



$$S_2 = \frac{\Delta x}{3}(y_0 + 4y_1 + y_2)$$

x_0 x_1 x_2 x_n

is n even? → make it even if not

$x = \text{linspace}(a, b, n+1)$

$y = f(x)$

y_0 $4y_1$ $2y_2$ $4y_3$ ... $4y_{n-1}$ y_n

$y(2:2:end-1) = 4 * y(2:2:end-1)$

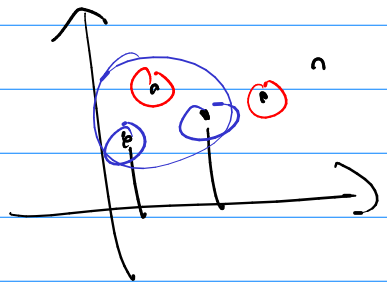
$y(3:2:end-2) = 2 * y(3:2:end-2)$

$$S_n = \frac{\Delta x}{3}\,\text{sum}(y)$$

plot $y = f(x)$

mids are $f(2:2:end-1)$

ends are $f(1:2:end)$



1st Parabola

y-coord $y(1)$ $y(2)$ $y(3)$

L M R

x-coord $x(1)$ $x(2)$ $x(3)$

L M R

$$y = ax^2 + bx + c$$

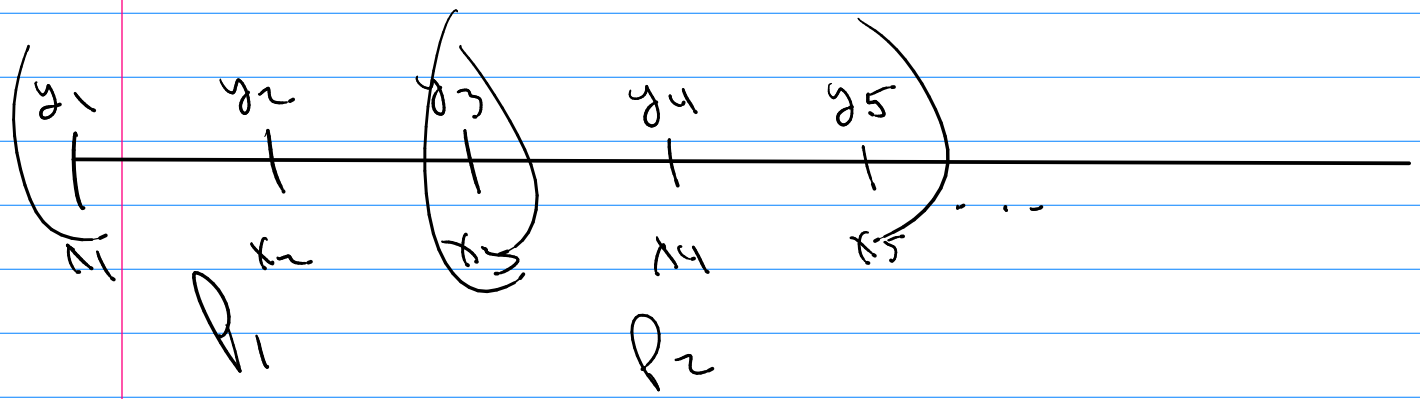
$$y_1 = ax_1^2 + bx_1 + c$$
$$y_2 = ax_2^2 + bx_2 + c$$
$$y_3 = ax_3^2 + bx_3 + c$$

$$\begin{bmatrix} x_1^2 & x_1 & 1 \\ x_2^2 & x_2 & 1 \\ x_3^2 & x_3 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$$

Parabola #1

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} x_1^2 & x_1 & 1 \\ x_2^2 & x_2 & 1 \\ x_3^2 & x_3 & 1 \end{bmatrix} \backslash \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$$

plot ax^2+bx+c from x_1 to x_3



Note: plot ax^2+bx+c from x_1 to x_3

ezplot(@(x) a.*x.^2 + b.*x + c, [x1 x3])

chaos game = IFS fractal

start with a point : p

- plot the point

loop

we are given a system of transformations (mixer) for the point. $= \{T_1(p), T_2(p), \ldots, T_n(p)\}$

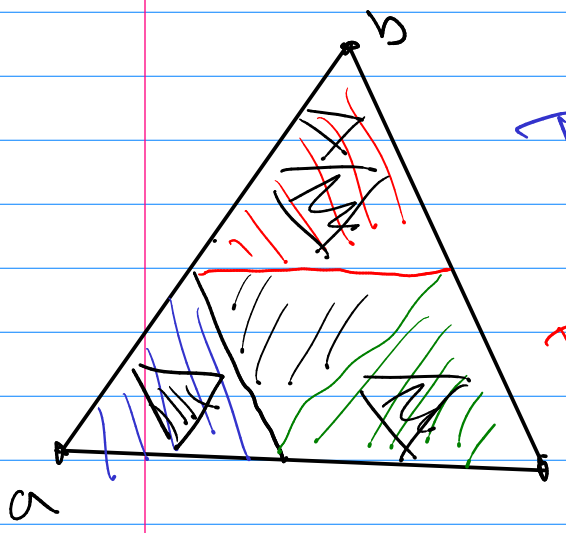
take n-random possibilities.

n_1 % of the time $p = T_1(p)$

n_2 % of the time $p = T_2(p)$

:

plot the point



T_1: 1/3 of the time $p \to$ 1/2 the distance to a

$p = \frac{(a+p)}{2}$

T_2: 1/3 of the time $p = (a+b)/2$

T_3: 1/3 of the time $p = (a+c)/2$

$T_1(p)$: $p = (p+a).*(.5)$;

plot(p)

Complex #'s

$b = 1+1i$

$p = .5+.5i$

$a = 0$ to i

c to $i = c$

$$p = \frac{a+b}{2}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2}\begin{bmatrix} a_1 \\ a_2 \end{bmatrix} + \frac{1}{2}\begin{bmatrix} x \\ y \end{bmatrix}$$

$$= \begin{bmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} + \frac{1}{2}\begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$$

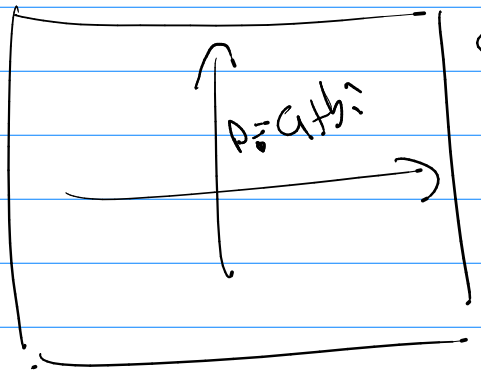
$$p_n = T(p_{n-1})$$

$$T(x) = (x)^2$$

$1/2, 1/4, 1/16, \ldots \to 0$

$2, 4, 16, \ldots \to \infty$

$1, 1, 1, \ldots \to 1$



Φ $p_n = T(p_{n-1})$

$p = p^2 + p_0$