Math 451

1st Friday's lecture is Online Only

⇒ No in-class lecture Friday.

Proj 3

gaussbacksolve, gaussjordan, linearsolver(A, b, typ)

$Ax = b$

→ [A b]

→ return x

→ use it on several exercises

Exam: (100pts)

$F(x) = \int_0^x e^{-t^2}\,dt$

In-class (5)

```
for i = 1:length(x)
    for j = 1:length(x)
        D(i,j) = x(i) + x(j);
    end
end
```

See textbook (video)

(6) $\frac{1}{10} + \frac{1}{9!} + \cdots + \frac{1}{101}$

```
sum(1./factorial(1:2:101))
```

```
b = 1:2:101
b = factorial(b)
b = 1./b
S = sum(b)
```

shuffle

```
function [S] = shuffle(X)
S = [];
n = round(length(X)./2);
leftdeck = X(1:n);
rightdeck = X(n+1:end);
while length(X) >> 
    n = randi([3,1]);
    S = [X(1:n) S];
    X(1:n) = [];
end
S = [X S];
end
```

split?

Interpolating Polynomials

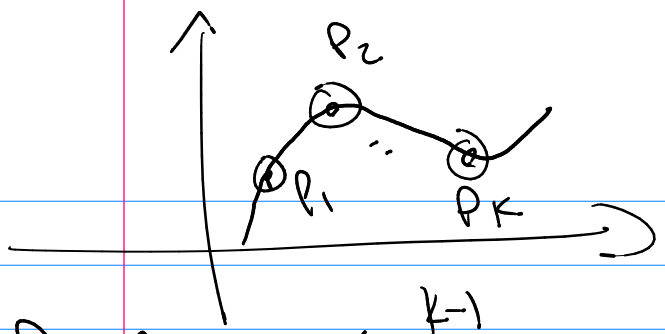
Poly of degree (K-1) (so it has K terms) that pass through K points.

(1) $P_1 = (x_1, y_1)$, $P_2 (x_2, y_2)$, ..., $P_K (x_K, y_K)$

(2) $P(x) = c_K x^{K-1} + c_{K-1} x^{K-2} + \cdots + c_2 x + c_1 x$

for <u>found</u> coeff's $c_K, \ldots, c_2, c_1$

(3) We need to find c_i given P_i



points on curve so...

$$p_1: \; c_K(x_1)^{K-1} + c_{K-1}(x_1)^{K-2} + \cdots + c_2(x_1) + c_1 = y_1$$

$$p_2: \; c_K(x_2)^{K-1} + c_{K-1}(x_2)^{K-2} + \cdots + c_2(x_2) + c_1 = y_2$$

$$\vdots$$

$$p_K: \; c_K(x_K)^{K-1} + c_{K-1}(x_K)^{K-2} + \cdots + c_2(x_K) + c_1 = y_K$$

→ System of linear eqn's

$$\begin{bmatrix} x_1^K & x_1^{K-1} & \cdots & x_1 & 1 \\ x_2^K & x_2^{K-1} & & x_2 & 1 \\ \vdots & \vdots & & \vdots & \\ x_K^K & x_K^{K-1} & & x_K & 1 \end{bmatrix} \begin{bmatrix} c_K \\ c_{K-1} \\ \vdots \\ c_1 \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_K \end{bmatrix}$$

So $p_1 = (x_1, y_1), \ldots, p_K = (x_K, y_K)$ ←

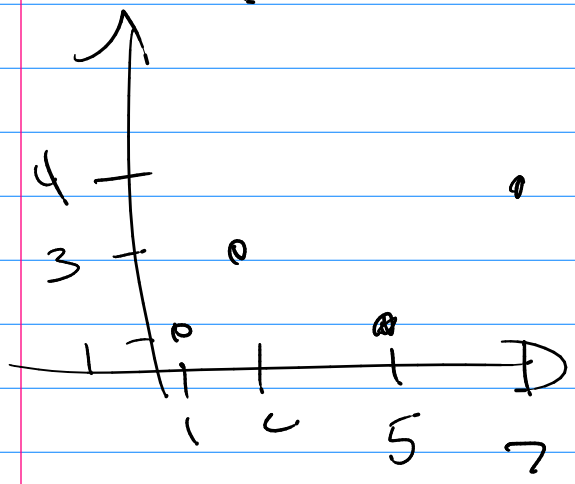
Let $x = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_K \end{bmatrix}$ $y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_K \end{bmatrix}$ be our coords of

$$\begin{bmatrix} x.^{\wedge}(K-1) & x.^{\wedge}(K-2) & \cdots & x.^{\wedge}1 & x.^{\wedge}0 \end{bmatrix} c = y$$

Vandermonde Matrix for the interpolating poly.

Q4 (See video)

$$x = \begin{bmatrix} 1 \\ 2 \\ 5 \\ 7 \end{bmatrix} \quad y = \begin{bmatrix} 1 \\ 3 \\ 1 \\ 4 \end{bmatrix}$$



See video