



$$f_3(x) = a_0 + a_1x + a_2x^2 + a_3x^3$$

Find  $v(16)$

Choose 4 data point close to 16  
(See Fig on left)

t	v
0	0
10	227.04
15	362.78
20	517.35
22.5	602.97
30	901.67

$$227.04 = a_0 + a_1(10) + a_2(10)^2 + a_3(10)^3$$

$$362.78 = a_0 + a_1(15) + a_2(15)^2 + a_3(15)^3$$

$$517.35 = a_0 + a_1(20) + a_2(20)^2 + a_3(20)^3$$

$$602.97 = a_0 + a_1(22.5) + a_2(22.5)^2 + a_3(22.5)^3$$

There are 4 eq<sup>n</sup> and 4 Unknown

$$\begin{bmatrix} 1 & 10 & 100 & 1000 \\ 1 & 15 & 225 & 3375 \\ 1 & 20 & 400 & 8000 \\ 1 & 22.5 & 506.25 & 11390.625 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \end{bmatrix} = \begin{bmatrix} 227.04 \\ 362.78 \\ 517.35 \\ 602.97 \end{bmatrix}$$

$$D = \begin{vmatrix} 1 & 10 & 100 & 1000 \\ 1 & 15 & 225 & 3375 \\ 1 & 20 & 400 & 8000 \\ 1 & 22.5 & 506.25 & 11390.625 \end{vmatrix} = 9553281.25$$

$$D_1 = \begin{vmatrix} 227.04 & 16 & 100 & 1000 \\ 362.78 & 15 & 225 & 3375 \\ 517.35 & 20 & 400 & 8000 \\ 602.97 & 22.5 & 506.25 & 11390.625 \end{vmatrix}$$

Use Cramer's rule  
find

$$\Delta = 58593.75 \quad \Delta_1 = -249257.8125 \quad \Delta_2 = 1246027.34$$

$$a_0 = -4.254 \left[ a_0 = (\Delta_1/\Delta) \right] \quad a_2 = 0.132 \quad \Delta_3 = 7736.718$$

$$a_1 = 21.26 \left[ a_1 = (\Delta_2/\Delta) \right]$$

$$\left[ a_2 = (\Delta_3/\Delta) \right]$$

$$\Delta_4 = 318.4375$$

$$a_3 = 0.0054$$

$$\left[ a_3 = \Delta_4/\Delta \right]$$

$$V(t) = -4254 + 21.26 t + 0.13204 t^2 + 0.00543 t^3$$