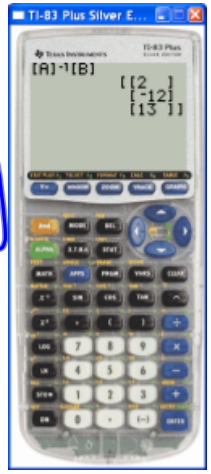
5.7-Curve Fitting with Quadratic Models

Find a quadratic function whose graph contains the points (1, 3), (2, -3), and (6,13).

$f(x)=ax^2+bx+c$

Point	Substitution	Equation
(1, 3)	$a(1)^2+b(1)+c=3$	$a+b+c=3$
(2, -3)	$a(2)^2+b(2)+c=-3$	$4a+2a+c=-3$
(6, 13)	$a(6)^2+b(6)+c=13$	$36a+6b+c=13$

$$\begin{bmatrix} 1 & 1 & 1 \\ 4 & 2 & 1 \\ 36 & 6 & 1 \end{bmatrix}\begin{bmatrix} a \\ b \\ c \end{bmatrix}=\begin{bmatrix} 3 \\ -3 \\ 13 \end{bmatrix}$$

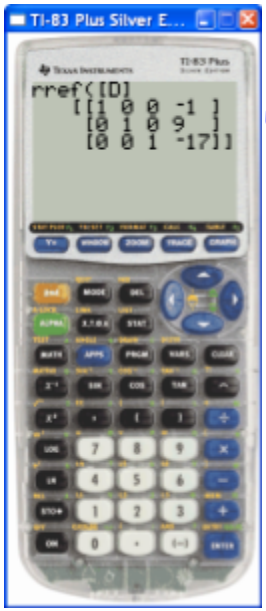


$f(x)=2x^2-12x+13$

Find a quadratic function whose graph contains the points (4, 3), (2, -3), and (6,1).

Point	Substitution	Equation
(4, 3)	$a(4)^2+b(4)+c=3$	$16a+4b+c=3$
(2, -3)	$a(2)^2+b(2)+c=-3$	$4a+2b+c=-3$
(6, 1)	$a(6)^2+b(6)+c=1$	$36a+6b+c=1$

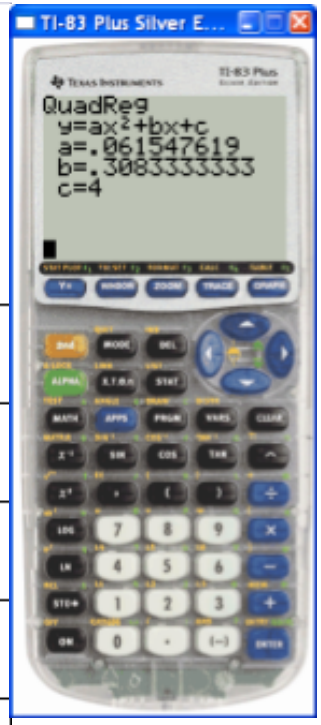
$$\begin{bmatrix} 16 & 4 & 1 & : & 3 \\ 4 & 2 & 1 & : & -3 \\ 36 & 6 & 1 & : & 1 \end{bmatrix}$$



$f(x)=-x^2+9x-17$

Make a scatter plot for the data in the table below.
Find a quadratic model to represent this data.

Speed (MPH)	Stopping Distance (ft)
10	12.5
20	36.0
30	69.5
40	114.0
50	169.5
60	249.0
70	325.5



$f(x)=.06x^2+.31x+4$

Homework

Pg. 327-328 #14-22 even, 23-30 all

16) $(-1,5)\ (4,5)\ (8,-13)$

$f(x)=ax^2+bx+c$

$a(-1)^2+b(-1)+c=5$ $\quad a-b+c=5$

$a(4)^2+b(4)+c=5$ $\quad 16a+4b+c=5$

$a(8)^2+b(8)+c=-13$ $\quad 64a+8b+c=-13$

$$\begin{bmatrix} 1 & -1 & 1 \\ 16 & 4 & 1 \\ 64 & 8 & 1 \end{bmatrix}\begin{bmatrix} a \\ b \\ c \end{bmatrix}=\begin{bmatrix} 5 \\ 5 \\ -13 \end{bmatrix}$$

$f(x)=-.5x^2+1.5x+7$

18) $(0,4)\ (2,1)\ (-2,3)$

$0a+0b+c=4$

$4a+2b+c=1$

$4a-2b+c=3$

$$\begin{bmatrix} 0 & 0 & 1 \\ 4 & 2 & 1 \\ 4 & -2 & 1 \end{bmatrix}\begin{bmatrix} a \\ b \\ c \end{bmatrix}=\begin{bmatrix} 4 \\ 1 \\ 3 \end{bmatrix}$$

$f(x)=-.5x^2-.5x+4$

22)

Cube	3 Faces	2 Faces	1 Face
2	8	0	0
3	8	12	6
4	8	24	24
5	8	36	54
6	8	48	96

D)

X	8	$12x-24$ $12(x-2)$	$6x^3-24+24$ $6(x-2)^3$

C)

7	8	60	150
8	8	72	216
20	8	216	1944

23) $h(t) = -6t^2 + 20t + 5$

24) 5 ft.
20 ft./sec

25) $x = -\frac{b}{2a} = -\frac{20}{2(6)} = \frac{20}{12} = \frac{5}{3} = 1\frac{2}{3}$ sec

26) $21\frac{2}{3}$ ft.

27) about 3.57 sec

28) 17.5 ft.

29) $-6t^2 + 20t + 5 = 16$
$-16 \quad -16$
$-6t^2 + 20t - 11 = 0$
.69 sec., 2.64 sec

30) a) $P(n) = -n^2 + 160n - 400$

b) 80 computers

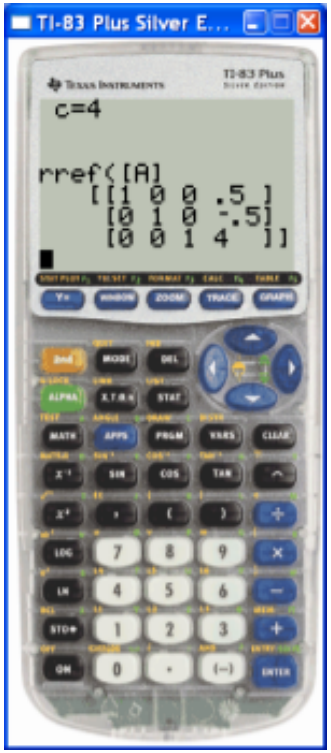
c) $6000

Homework

pg. 327, 329 #15-21 odd, 31

19) (-2,7) (4,10) (1,4)

$f(x) = .5x^2 - .5x + 4$

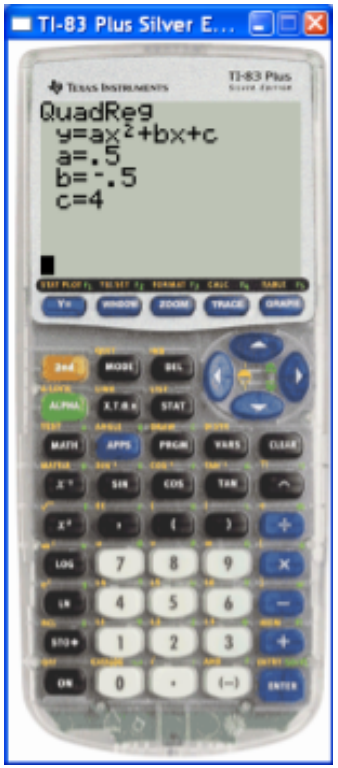


$4a - 2b + c = 7$

$16a + 4b + c = 10$

$1a + 1b + c = 4$

$f(x) = .5x^2 - .5x + 4$



31) $f(x) = -15.1x^2 + 15.2x + 1.7$