IA 8.7 - Quadratic Regression vs. Linear Reg.
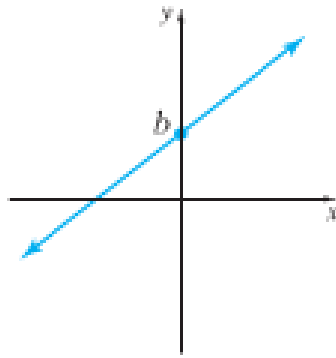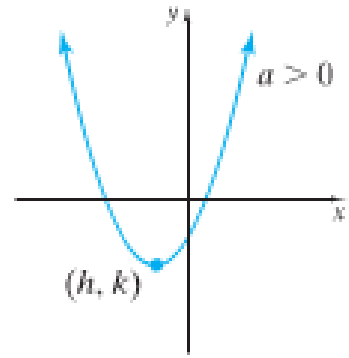
In review,

Linear Model
$y = mx + b$
slope: m
y-intercept: $(0, b)$

Quadratic Model
$y = ax^2 + bx + c$
$a > 0$, parabola opens upward
$a < 0$, parabola opens downward
vertex: (h, k) where $h = \dfrac{-b}{2a}$

Looking at models, we may have to decide whether to use linear or quadratic regression.

EXAMPLE 1 Determining the Better Model for the Cost of a U.S. First-Class Postage Stamp

The cost of U.S. first-class postage stamps has risen over the years between 1917 and 2008.

$\left(\begin{array}{c} R^2 \text{ closer to } 1 \\ \text{means better fit} \end{array} \right)$

Years since 1900	17	19	32	58	63	68	71	74	75	78	81
Cost	3	2	3	4	5	6	8	10	13	18	20

Years since 1900	85	88	91	101	102	106	107	108
Cost	22	25	29	34	37	39	41	42

a. Graph the data in the table. Let $x = 0$ represent the year 1900.
b. Find a linear regression equation that models the data.
c. Find a quadratic equation that models the data.
d) Which is a better fit? What if we restrict the data?

2)a) Looking at the plotted data, guess whether linear or quadratic modeling would be best.

b) Find the linear & Quadratic Regressions

c) Use R^2 to verify which is a "better" model.

Year	Annual Recreational Visits (millions)
1930	7
1940	17
1950	27
1960	88
1970	175
1980	230
1990	255
1996	341

Table 17: Visits to National Forests (*Source: USA Today*)

3)a) Find the quadratic regression equation.

b) Use it to predict cancer deaths in men in 2010.

c) Predict when cancer will be "cured." Does this make sense?

Year	Number of Deaths Per 100,000 men
1980	205.3
1985	212.6
1989	217.6
1993	212.1
1997	201.9

Table 23: Cancer Deaths of Men (*Source: USA Today*)