1 Consider the graph of the quadratic function $f(x)=-2 x^{2}+2 x-3$.
I have $a=-2, b=2$, and $c=-3$.
a Find the vertex of this graph. (Show what numerical calculations you make or what equation you solve.)
First,

$$
h=-\frac{b}{2 a}=-\frac{2}{2(-2)}=\frac{1}{2} .
$$

Next,

$$
k=f(h)=f\left(\frac{1}{2}\right)=-2\left(\frac{1}{2}\right)^{2}+2\left(\frac{1}{2}\right)-3=-\frac{5}{2} .
$$

Therefore, the vertex is

$$
\left(\frac{1}{2},-\frac{5}{2}\right) .
$$

$b$ Find the intercepts of this graph. (Show what numerical calculations you make or what equation you solve.)
Since $c=-3$, the vertical intercept is

$$
(0,-3) .
$$

Since $a$ and $k$ have the same sign (both negative), there are no horizontal intercepts.
2 The price at which $x$ widgets can be sold is

$$
p=-\frac{1}{6} x+100
$$

dollars each.
a Write an expression for the total revenue (in dollars) as a function of the quantity sold.
Revenue is price times quantity:

$$
R=x p=x\left(-\frac{1}{6} x+100\right) .
$$

(In other words, $R=f(x)$, where $f(x)=x\left(-\frac{1}{6} x+100\right)$.)
$b$ What quantity $x$ will result in the maximum revenue? (Or if you prefer, give the maximum revenue. In either case, show what equation you solve or what numerical calculation you make, and be sure to include correct units of measurement in your final answer.)

The revenue $R$ is a quadratic function of $x$ :

$$
R=x\left(-\frac{1}{6} x+100\right)=-\frac{1}{6} x^{2}+100 x .
$$

This is quadratic with $a=-1 / 6, b=100$, and $c=0$, so

$$
h=-\frac{b}{2 a}=-\frac{100}{2(-1 / 6)}=300
$$

and

$$
k=f(h)=f(300)=(300)\left(-\frac{1}{6}(300)+100\right)=15000 .
$$

Since $a<0$, this vertex marks the maximum value of the function, which is the maximum revenue that we want. Therefore, the maximum revenue occurs when the quantity is 300 (and the maximum revenue is 15000 dollars).

