1.4

32. $R(x) = -3x^2 + 20x$ $\quad\quad$ $C(x) = 2x + 15$

a. $P(x) = R(x) - C(x)$

$= -3x^2 + 20x - (2x + 15)$

$= -3x^2 + 20x - 2x - 15$

$= -3x^2 + 18x - 15$

To find the profit equation, I subtracted the cost function from the revenue function.

b. (h, k)

$h = \frac{-b}{2a} = {-18}/{2(-3)} = 3$

to check:

$k = c - b^2/4a = -15 - 18^2/4(-3) = 12$

$12 = -3x^2 + 18x - 15$

$0 = -3x^2 + 18x - 27$

$0 = -3(x^2 - 6x + 9)$

$0 = -3(x - 3)^2$

$0 = (x - 3)$

$3 = x$

To find the value of x that maximizes profit, I used the equation $h = \frac{-b}{2a}$, and to check I used the equation $k = c - b^2/4a$, then set the profit equation equal to k, and solved for x.

c. $P(x) = -3x^2 + 18x - 15$

$0 = -3x^2 + 18x - 15$

$= -3(x^2 - 6x + 5)$

$= -3(x - 5)(x - 1)$

$0 \neq 3 \quad 0 = x - 5 \quad 0 = x - 1$

$5 = x \quad 1 = x$

to check:

$0 = -3x^2 + 18x - 15$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-18 \pm \sqrt{(18)^2 - (4)(-3)(-15)}}{2(-3)}$

$= \frac{-18 \pm 12}{-6}$

$x = 1$

$x = 5$

To find the value of x for which the profit is zero, I set the profit equation equal to zero and solved x to be 1 and 5. To check I plugged the values for a, b, & c into the quadratic equation.

x	0	1	2	3	4	5	6
y	-15	0	9	12	9	0	-15