3.4

Q11 a)

x	$p(x)$
200	10
193	10.5

$m = \frac{0.5}{-7} = -\frac{1}{14}$

$\frac{x-200}{14} = \frac{p(x)-10}{-1}$

$\therefore p(x) = \frac{-x+340}{14}$

So, $P(x) = x \cdot p(x) - C(x)$

$= \frac{-x^2+340x}{14} - 6x$

$\therefore P(x) = -\frac{1}{14}x^2 + \frac{128}{7}x$

So $P'(x) = -\frac{1}{7}x + \frac{128}{7}$

$P'(x) = 0$ when $x = 128$

And $p(128) = \$15.14$

Thus, $P(128) = 128(15.14) - 6(128)$

$= \$1169.92$

11b) $P(x) = x \cdot p(x) - 7.5x$, if $x < 165$

$= \frac{-x^2+340x}{14} - 7.5x$

$\therefore P(x) = -\frac{1}{14}x^2 + \frac{235}{14}x$, if $x < 165$

So $P'(x) = -\frac{2}{14}x + \frac{235}{14}$ and $P'(x) = 0$ when $x = 117.5$

Well, $P(117) = 117(15.93) - 877.5$ and $P(118) = 118(15.86) - 885$

$= \$986.31$ $\qquad$ $= \$986.48$

11b continued

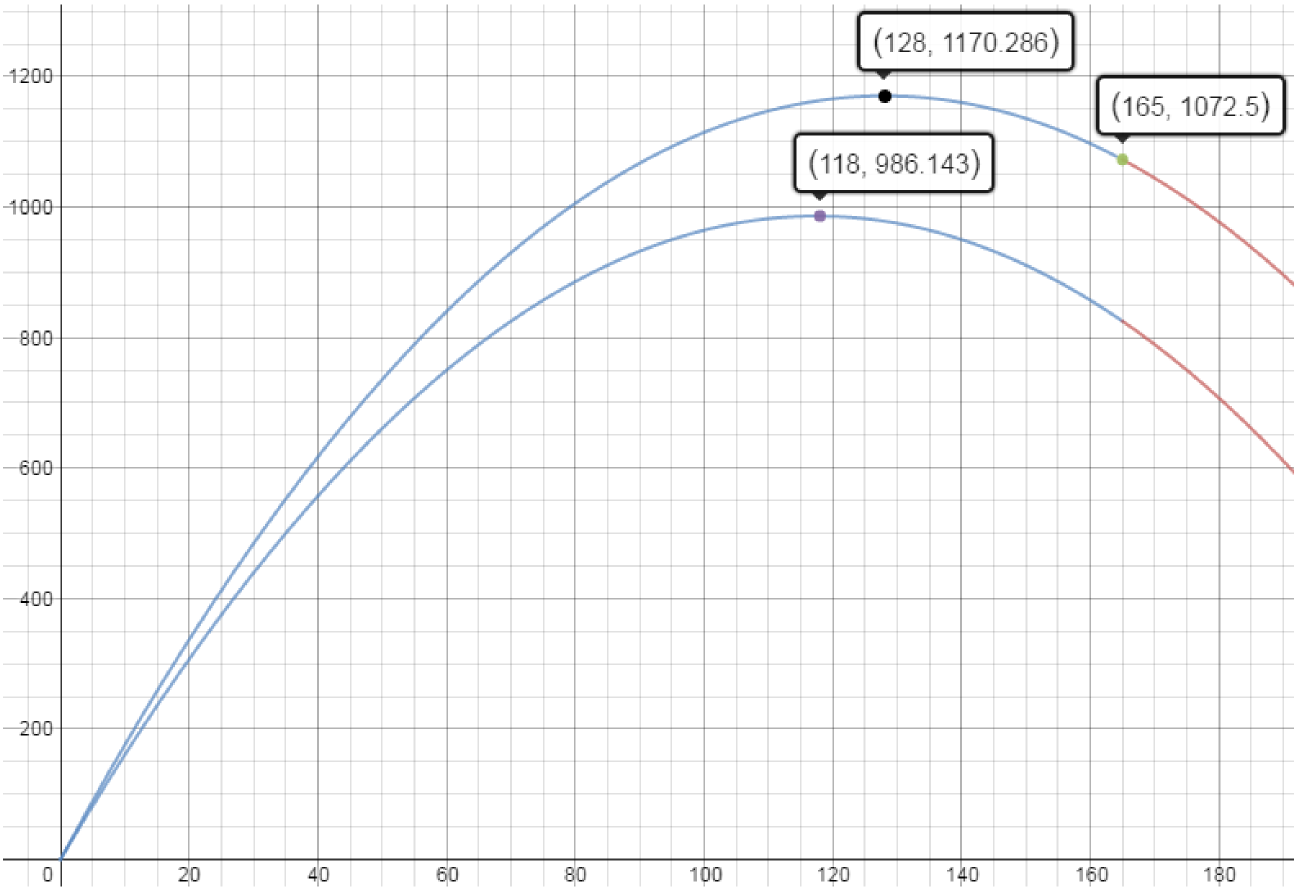
If $x \geq 165$, then $P(x) = -\frac{1}{14}x^2 + \frac{128}{7}x$

and the maximum of $P(x)$ occurs when $x = 128$.

But $x \geq 165$, so max of $P(x)$ occurs when $x = 165$.

$$P(165) = 165(12.50) - 990$$
$$= \$1072.50$$

Whence, the maximum profit of \$1072.50 is obtained when the price is \$12.50/cake and 165 cakes would be sold.



Q15 x rep 1000 units

$p(x) = 2000 - 5x$ dollars per unit

$C(x) = 15\,000\,000 + 1800\,000x + 75x^2$

So, $P(x) = R(x) - C(x)$

$= (\text{number of sales}) \cdot p(x) - C(x)$

$= 1000x \cdot p(x) - C(x)$

$= 2000\,000x - 5000x^2 - C(x)$

Thus, $P'(x) = 2\,000\,000 - 10000x$

$- 1800\,000 - 150x$

$= 10150x - 200\,000$

So, $P'(x) = 0$ when $x \doteq 19.70443\ldots$

Thence, 19704 units of production will maximize profits.