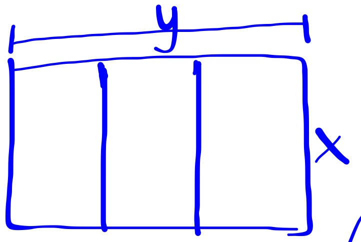
p.177 #17

a)



$$280 = 4x + 2y$$
$$280 - 4x = 2y$$
$$140 - 2x = y$$

$$A = x \cdot y$$
$$A = x \cdot (140 - 2x)$$
$$A = -2x^2 + 140x$$ ← quadratic since it is a polynomial of degree 2.

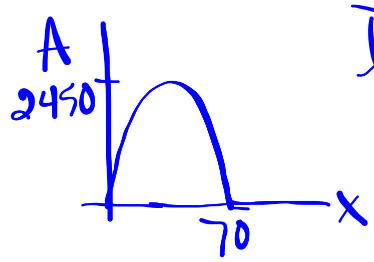
c)
$$A = -2(x^2 - 70x)$$
$$= -2(x^2 - 70x + 1225 - 1225)$$
$$= -2(x - 35)^2 + 2450$$

Vertex $= (35, 2450)$

Maximum area $= 2450\ m^2$

when $x = 35\,m$ (width)

d)



$D: \{x \mid 0 < x < 70, x \in R\}$

$R: \{A \mid 0 < A \leq 2450, A \in R\}$

p.194 #13)

$$C(n) = 75n^2 - 1800n + 60000$$
$$= 75(n^2 - 24n) + 60000$$
$$= 75(n^2 - 24n + 144 - 144) + 60000$$
$$= 75(n-12)^2 - 10800 + 60000$$
$$= 75(n-12)^2 + 49200$$

vertex = $(12, 49200)$ ← minimum point

∴ Minimum cost of \$49200 will occur when $n = 12$, so when # of items = 12000.

(n = # of items in thousands)

p.195 #19)

a) Let x represent the # of \$10 price increases, and R = revenue in \$.

$$\therefore R = (360 + 10x)(280 - 5x)$$
$$= 100800 - 1800x + 2800x - 50x^2$$
$$= -50x^2 + 1000x + 100800$$

b)
$$R = -50(x^2 - 20x) + 100800$$
$$= -50(x^2 - 20x + 100 - 100) + 100800$$
$$= -50(x-10)^2 + 5000 + 100800$$
$$= -50(x-10)^2 + 105800$$

vertex = (10, 105800) ← maximum point

$\therefore$ Maximum revenue of \$105800 when $x = 10$, so when

price per bike = $360 + 10(10)$
= \$460

p.196 #20)

Note: textbook converts values to kg first...

a) Let x represent # of additional rows

and $M =$ total mass of peas in grams

$$\therefore M = (30 + x)(4000 - 100x)$$

$$= 120000 - 3000x + 4000x - 100x^2$$

$$= -100x^2 + 1000x + 120000$$

b) $$M = -100(x^2 - 10x) + 120000$$

$$= -100(x^2 - 10x + 25 - 25) + 120000$$

$$= -100(x-5)^2 + 2500 + 120000$$

$$= -100(x-5)^2 + 122500$$

vertex $= (5, 122500)$ ← Max. point

$\therefore$ Max. amount of peas $= 122500$ grams

$= \underline{122.5 \text{ kg}}$

when $x = 5$, so when farmer plants $30 + 5 = \underline{35 \text{ rows}}$

p.200 #17)

a) Let x represent # of \$2 price decreases, and R = revenue in \$.

$\therefore R = (40-2x)(10000+500x)$

$= 400000 + 20000x - 20000x - 1000x^2$

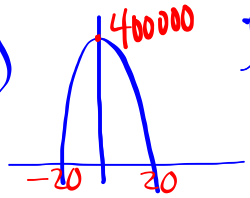
$= -1000x^2 + 400000$

b) vertex = (0, 400 000) ← max. pt.

$\therefore$ Max. revenue = \$400 000 when x = 0, $\therefore$ when price = \$40 per coat

d) y-intercept = 400000
represents the revenue if price per coat is not adjusted (x=0).
This also happens to be the max. possible revenue.

x-intercepts = 20 and -20
These values represent the # of \$2 price adjustments (increases or decreases) that would result in zero revenue.

e) 

$D: \{x \mid -20 \le x \le 20, x \in R\}$

$R: \{R \mid 0 \le R \le 400000, R \in R\}$