3-0235 — 50 SHEETS — 5 SQUARES
3-0236 — 100 SHEETS — 5 SQUARES
3-0237 — 200 SHEETS — 5 SQUARES
3-0137 — 200 SHEETS — FILLER
COMET

1)

1	22	22
2	21	42
3	20	60
4	19	76
5	18	90
6	17	102
7	16	112
8	15	120
9	14	126
10	13	130
11	12	132
12	11	132
13	10	130
14	9	126

b) $p = x \cdot y \qquad x + y = 23 \rightarrow y = 23 - x$

$$p(x) = x(23-x)$$
$$= 23x - x^2$$

$$p'(x) = 23 - 2x$$

$p'(x) = 0 \qquad 23 - 2x = 0$

$2x = 23$

$x = 11.5$ but x is an int, so candidate critical number are $x = 11, 12$

$$p(11) = 11(23-11) = 132$$
$$p(12) = 12(23-12) = 132$$

4) Find x s.t. $x + \frac{1}{x}$ is as small as possible $x \in \mathbb{R}^+$

$$V(x) = x + \frac{1}{x}$$
$$V'(x) = 1 - \frac{1}{x^2}$$

$V'(x) = 0 \qquad 1 - \frac{1}{x^2} = 0$

$\frac{1}{x^2} = 1$

$x^2 = 1$

$x = \pm 1$

$\therefore$ critical number $x = 1$

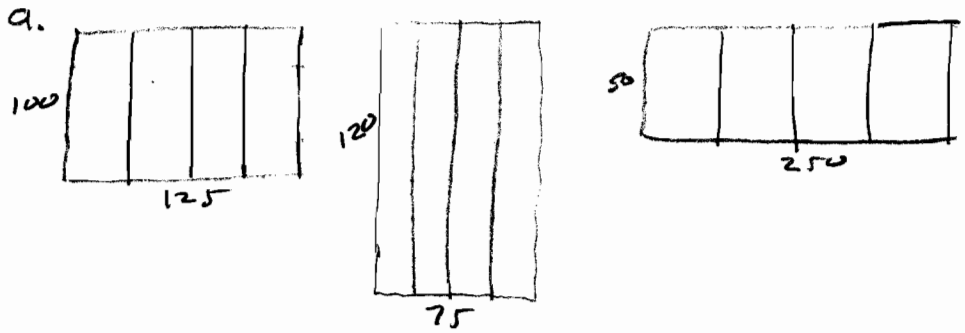
	$1 - \frac{1}{x^2}$	f'
$0 < x < 1$	$-$	$-$
$x > 1$	$+$	$+$

$\therefore$ local min at $x = 1 \quad V(1) = 2$

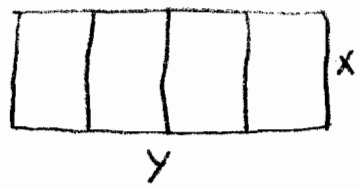
3-0235 — 50 SHEETS — 5 SQUARES
3-0236 — 100 SHEETS — 5 SQUARES
3-0237 — 200 SHEETS — 5 SQUARES
3-0137 — 200 SHEETS — FILLER
COMET

9) Rectangular area with 4 pens. Total of 750' of fence. What is largest possible area?

a.



b.



c. Area $= A = x \cdot y$

d. $5x + 2y = 750$

e. $y = \frac{1}{2}(750 - 5x)$

$A(x) = \dfrac{x(750-5x)}{2}$

f. $A'(x) = 375 - 5x$

$A'(x) = 0 \qquad 375 - 5x = 0$

$5x = 375$

$x = 75$

$\therefore$ critical number at $x = 75$

	$375-5x$	f'
$x < 75$	+	+
$x > 75$	−	−

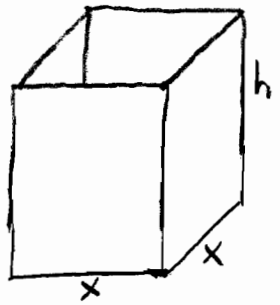
$\therefore x = 75$ is a max

$A(75) = \dfrac{75(750 - 5 \cdot 75)}{2} = 14{,}062.5 \text{ ft}^2$

$\therefore$ Max area is $14{,}062.5 \text{ ft}^2$ with $x = 75$ ft, $y = 187.5$ ft

3-0235 — 50 SHEETS — 5 SQUARES
3-0236 — 100 SHEETS — 5 SQUARES
3-0237 — 200 SHEETS — 5 SQUARES
3-0137 — 200 SHEETS — FILLER
COMET

12) Box with square base + open top has volume 32,000 cm^3
Find dimensions to minimize matials use for box.



Material used: $m = x^2 + 4xh$

Volume $= x^2 h = 32{,}000$

$$h = \frac{32000}{x^2}$$

$$m(x) = x^2 + 4x\left(\frac{32000}{x^2}\right)$$

$$= x^2 + \frac{128000}{x}$$

$$m'(x) = 2x - \frac{128000}{x^2}$$

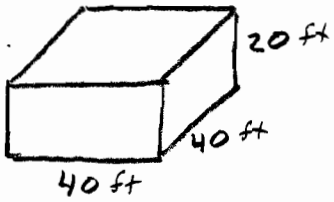
$m'(x) = 0 \qquad 2x = \frac{128000}{x^2}$

$$2x^3 = 128000$$
$$x^3 = 64000$$
$$x = 40$$

	$2x - 128000/x^2$
$x < 40$	$-$
$x > 40$	$+$

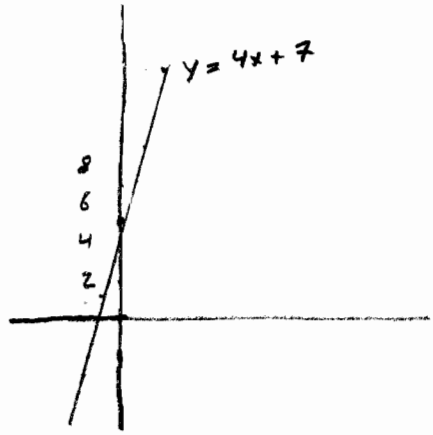
$\therefore x = 40$ min

box should be $40' \times 40' \times 20'$



3-0235 — 50 SHEETS — 5 SQUARES
3-0236 — 100 SHEETS — 5 SQUARES
3-0237 — 200 SHEETS — 5 SQUARES
3-0137 — 200 SHEETS — FILLER
COMET

17) Find point on line $y = 4x + 7$ closest to the origin.



Distance between two points (x_1, y_1) & (x_2, y_2) is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Distance from origin, i.e., $(x_2, y_2) = (0,0)$ is

$$d = \sqrt{x_1^2 + y_1^2}$$

we know $y = 4x + 7$ because the point lies on this line

$$d(x) = \sqrt{x^2 + (4x+7)^2}$$

minimizing distance is same as minimizing distance squared

$$f(x) = (d(x))^2 = x^2 + 16x^2 + 56x + 49$$

$$f'(x) = 34x + 56$$

$$f'(x) = 0 \qquad 34x + 56 = 0$$

$$x = -\frac{56}{34} = -\frac{28}{17}$$

$$y = 4\left(\frac{-28}{17}\right) + 7 = \frac{7}{17}$$

$\therefore$ The point closest to the origin that lies on the line $y = 4x + 7$ is $\left(\frac{-28}{17}, \frac{7}{17}\right)$