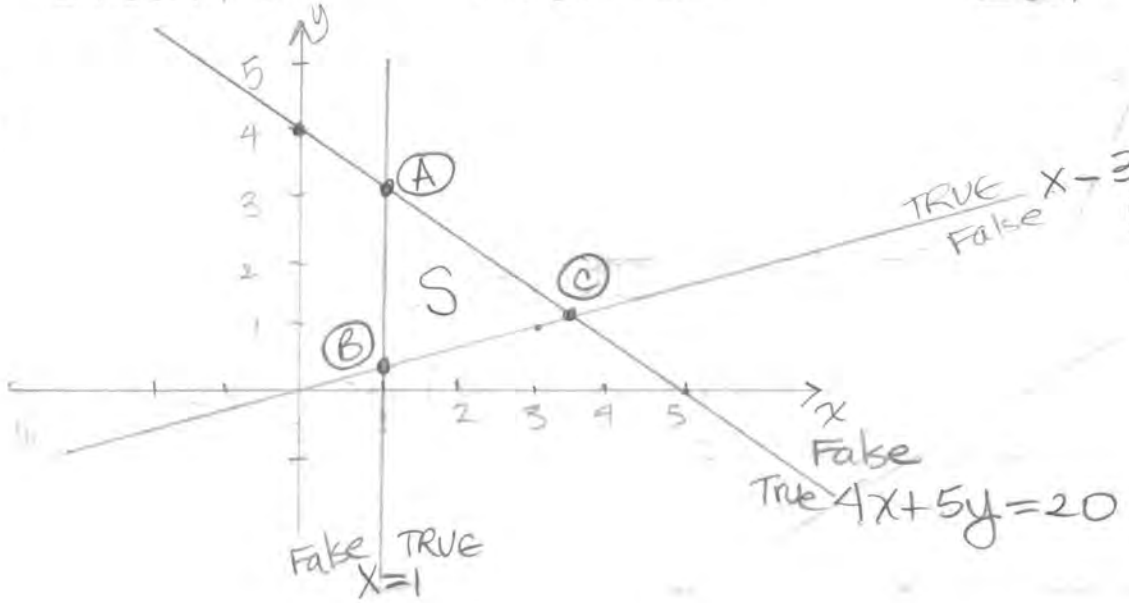
Exam 2 Part I Lin. Prog.

1.



corner A : $4x+5y=20$, $x=1$ $\rightarrow \left[\begin{array}{cc|c} 4 & 5 & 20 \\ 1 & 0 & 1 \end{array}\right] \xrightarrow{\text{rref}} \left[\begin{array}{cc|c} 1 & 0 & 1 \\ 0 & 1 & 3{,}2 \end{array}\right]$

$\Longrightarrow x=1, y=3{,}2$ or $(1, 3{,}2)$

corner B : $x-3y=0$, $x=1$ $\rightarrow \left[\begin{array}{cc|c} 1 & -3 & 0 \\ 1 & 0 & 1 \end{array}\right] \xrightarrow{\text{rref}} \left[\begin{array}{cc|c} 1 & 0 & 1 \\ 0 & 1 & 1/3 \end{array}\right]$

$\Longrightarrow x=1, y=1/3$ or $(1, 1/3)$

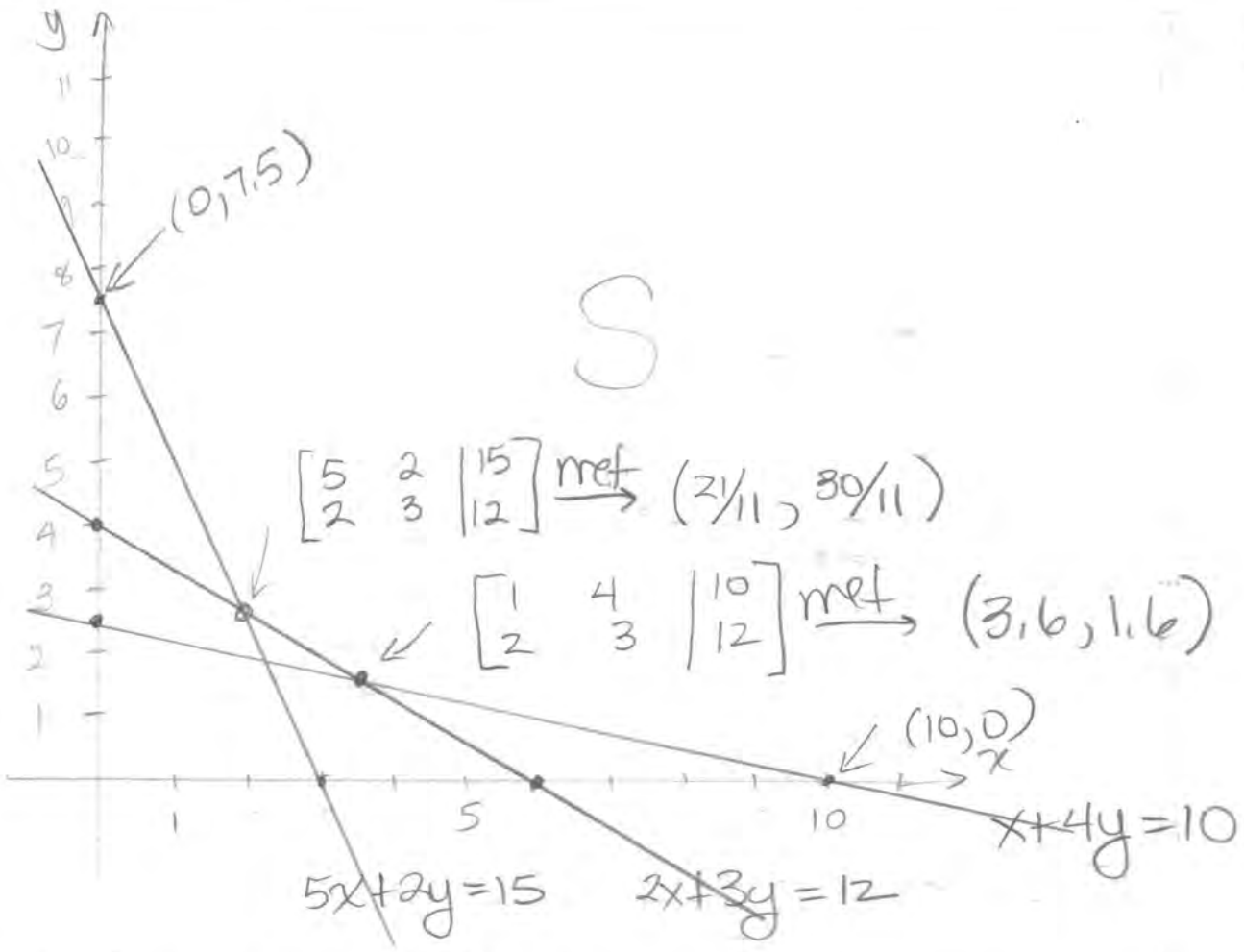
corner C : $4x+5y=20$, $x-3y=0$ $\rightarrow \left[\begin{array}{cc|c} 4 & 5 & 20 \\ 1 & -3 & 0 \end{array}\right] \xrightarrow{\text{rref}} \left[\begin{array}{cc|c} 1 & 0 & 60/17 \\ 0 & 1 & 20/17 \end{array}\right]$

$\Longrightarrow x=60/17, y=20/17$

corner	$f=3x-4y$
$(1, 3{,}2)$	$-9{,}8$
$(1, 1/3)$	$5/3$ $(\approx 1{,}7)$
$(60/17, 20/17)$	$100/17$ $(\approx 5{,}9)$

S is bounded, so both a min & max exist. The max is $f=100/17$ at $(60/17, 20/17)$ and the min is $f=-9{,}8$ at $(1, 3{,}2)$

2. (2)



This is unbounded with $x \geq 0$, $y \geq 0$, since $f = 2x + 8y$, there is a min but no max

corners	$f = 2x + 8y$
(0, 7.5)	60
(21/11, 30/11)	$2\frac{82}{11}$ (≈ 25.6)
(3.6, 1.6)	20
(10, 0)	20

The min value of f is 20 along the line segment connecting (3.6, 1.6) and (10, 0) or $2x + 8y = 20 \Rightarrow y = -\frac{1}{4}x + 2.5$ with $3.6 \leq x \leq$
There are ∞ solns on this line segment.

3. x = # of plots of SS strawberries
y = # of plots of LS strawberries
R = revenue in $

OBJECTIVE: MAX $R = 3*60*x + 4 * 40 *y$

SUBJECT TO

$x + y \leq 175$ available plots
$40y \geq 3(60x)$ ratio
$x \geq 0$
$y \geq 0$

Baskets LS $40y$

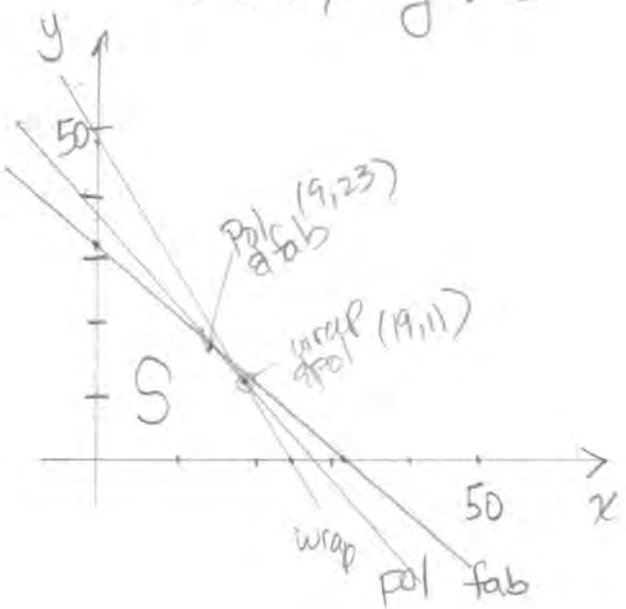
BKS SS $60x$

4. x = # of widgets made
y = # of gadgets made
P = profit in $

OBJECTIVE: Max $P = 3x + 5y$

SUBJECT TO

$(0,32)$ & $(32,0)$ $9x + 9y \leq 288$ fabrication minutes
$(0,33.8)$ & $(28,0)$ $12x + 10y \leq 338$ polishing minutes
$(0,26)$ & $(25,0)$ $11x + 6y \leq 275$ wrapping minutes
$x \geq 0, y \geq 0$ non-negativity



vertex	$P = 3x + 5y$
(0,32)	160 max
(9,23)	142
(19,11)	112
(25,0)	75

wrap & fab at (16.6, 15.4)

at (0,32) $9x + 9y = 9(0) + 9(32) = 288 \leq 288$ fabm
$12x + 10y = 12(0) + 10(32) = 320 \leq 338$ pol. mi
$11x + 6y = 11(0) + 6(32) = 192 \leq 275$ wrap mi

The max profit is $160 when 0 widgets and 32 gadgets are made. There are 0 fabrication minutes left, 18 polishing minutes and 83 wrapping minutes left