6.3 Foundations of Math 11

p. 318 # 4, 6, 8

4. a) $\{(x,y) \mid x+y \leq 3, x \in R, y \in R\}$
$\{(x,y) \mid y > 2, x \in R, y \in R\}$

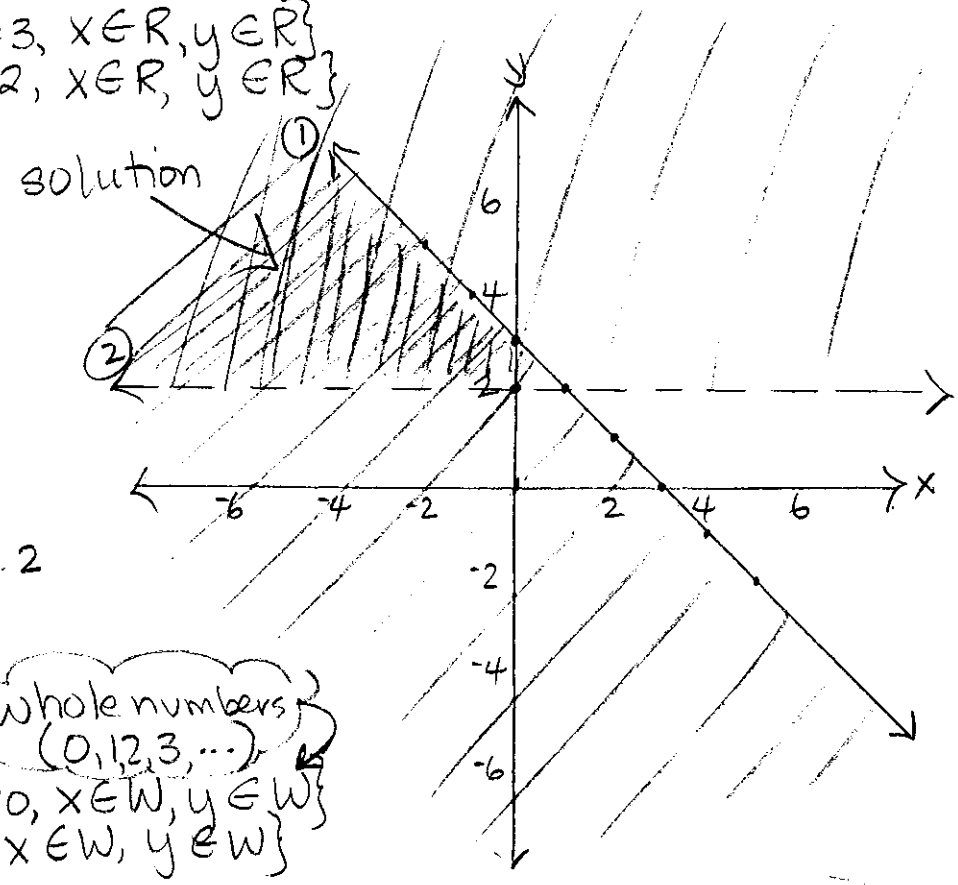
real numbers (all of them)

① $x+y \leq 3$
$y \leq -x+3$

try (0,0): $0+0 \leq 3$
$0 \leq 3$
true

solution

② $y > 2$
shade above 2



whole numbers (0, 1, 2, 3, ...)

b) $\{(x,y) \mid 2x+y > 0, x \in W, y \in W\}$
$\{(x,y) \mid y > x, x \in W, y \in W\}$

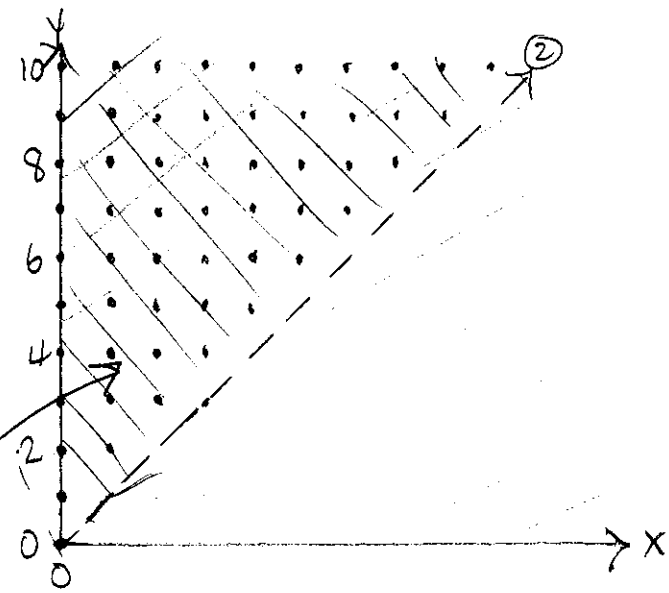
only use positive parts of axes because it is whole numbers

① $2x+y > 0$
$y > -2x+0$ line is not on graph

can't try (0,0) because it is on the line so try (1,1)
$2(1)+1 > 0$
$2+1 > 0$
$3 > 0$ true

② $y > x$ y-intercept is 0
slope is $\frac{1}{1}$

can't try (0,0) so try (2,1)
$1 > 2$ false so shade above the line

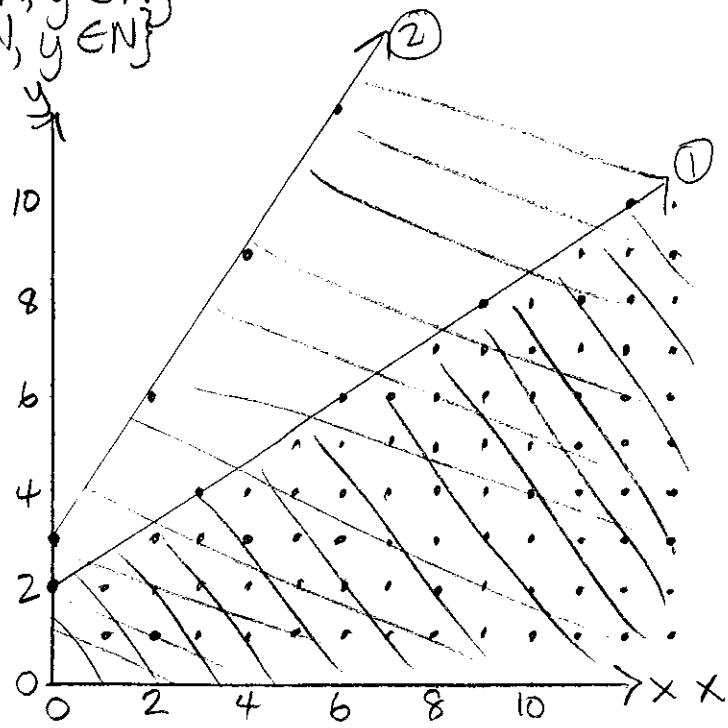


solution is whole numbers

p.318 cont.

Natural numbers (1, 2, 3, ...)

4. c) $\{(x,y) \mid 3y-2x \leq 6, x \in N, y \in N\}$
$\{(x,y) \mid 2y-3x \leq 6, x \in N, y \in N\}$



① $3y-2x \leq 6$
$3y \leq 2x+6$
$y \leq \frac{2}{3}x+2$

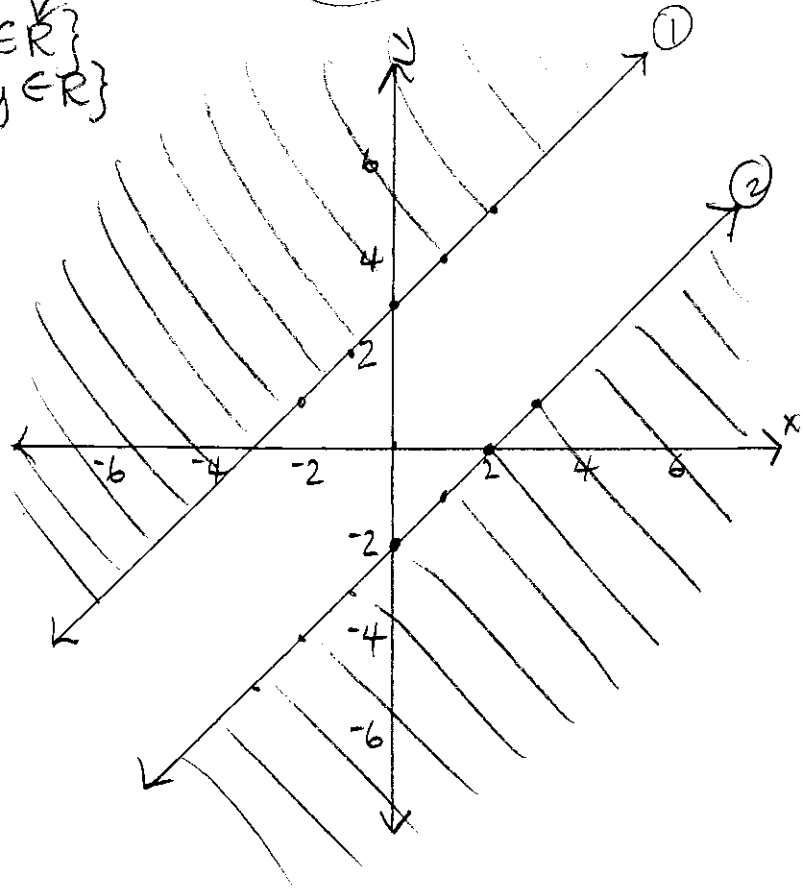
try (1,1)
$3(1)-2(1) \leq 6$
$3-2 \leq 6$
$1 \leq 6$ true

② $2y-3x \leq 6$
$2y \leq 3x+6$
$y \leq \frac{3}{2}x+3$

try (1,1): $2(1)-3(1) \leq 6$
$2-3 \leq 6$
$-1 \leq 6$ true

Real numbers (all of them)

d) $\{(x,y) \mid y-x \geq 3, x \in R, y \in R\}$
$\{(x,y) \mid y+2 \leq x, x \in R, y \in R\}$



① $y-x \geq 3$
$y \geq x+3$

try (0,0) $0-0 \geq 3$
$0 \geq 3$ false

② $y+2 \leq x$
$y \leq x-2$

try (0,0) $0+2 \leq 0$
$2 \leq 0$ false

no overlap so no solution

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6. two kinds of sandwiches
   - max 450 sandwiches needed
   - twice as many ham and cheese as egg salad

a) h: ham and cheese
   e: egg salad
   ① $h + e \leq 450$
   ② $2e \leq h$

b) $h \in W$, $e \in W$ must be whole numbers

c) see graph paper next page

d) pick any points in solution space - like 100 egg salad and 300 ham and cheese

8. social networking page
   - no more than 500 friends
   - at least 3 school friends for every rugby-friend

a) s: school friend
   r: rugby friend
   ① $s + r \leq 500$
   ② $3r \leq s$

b) friends must be counted in whole numbers
   $s \in W$, $r \in W$

c) pick any points in the solution space - like 350 school friends and 75 rugby friends

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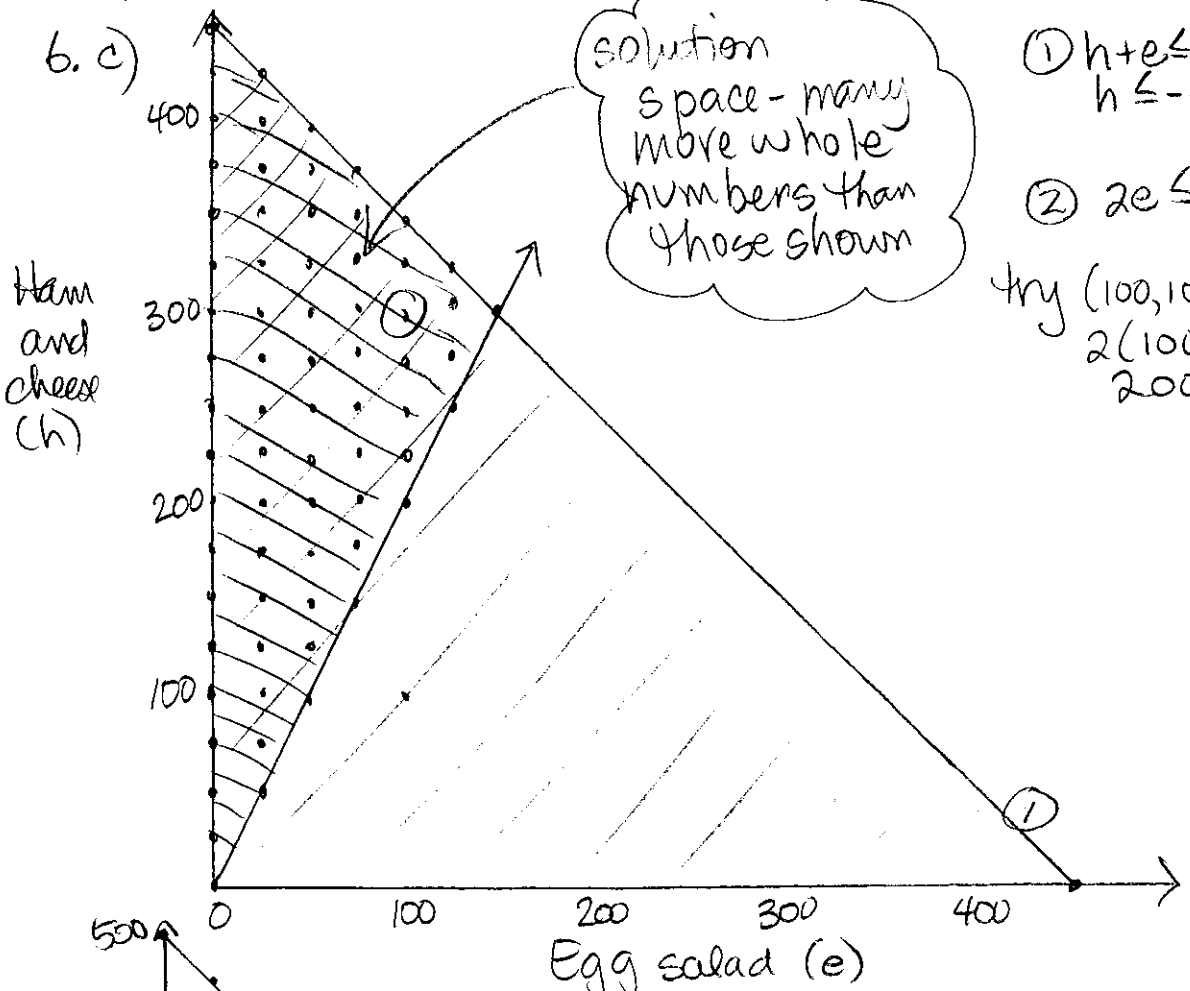
6. c)



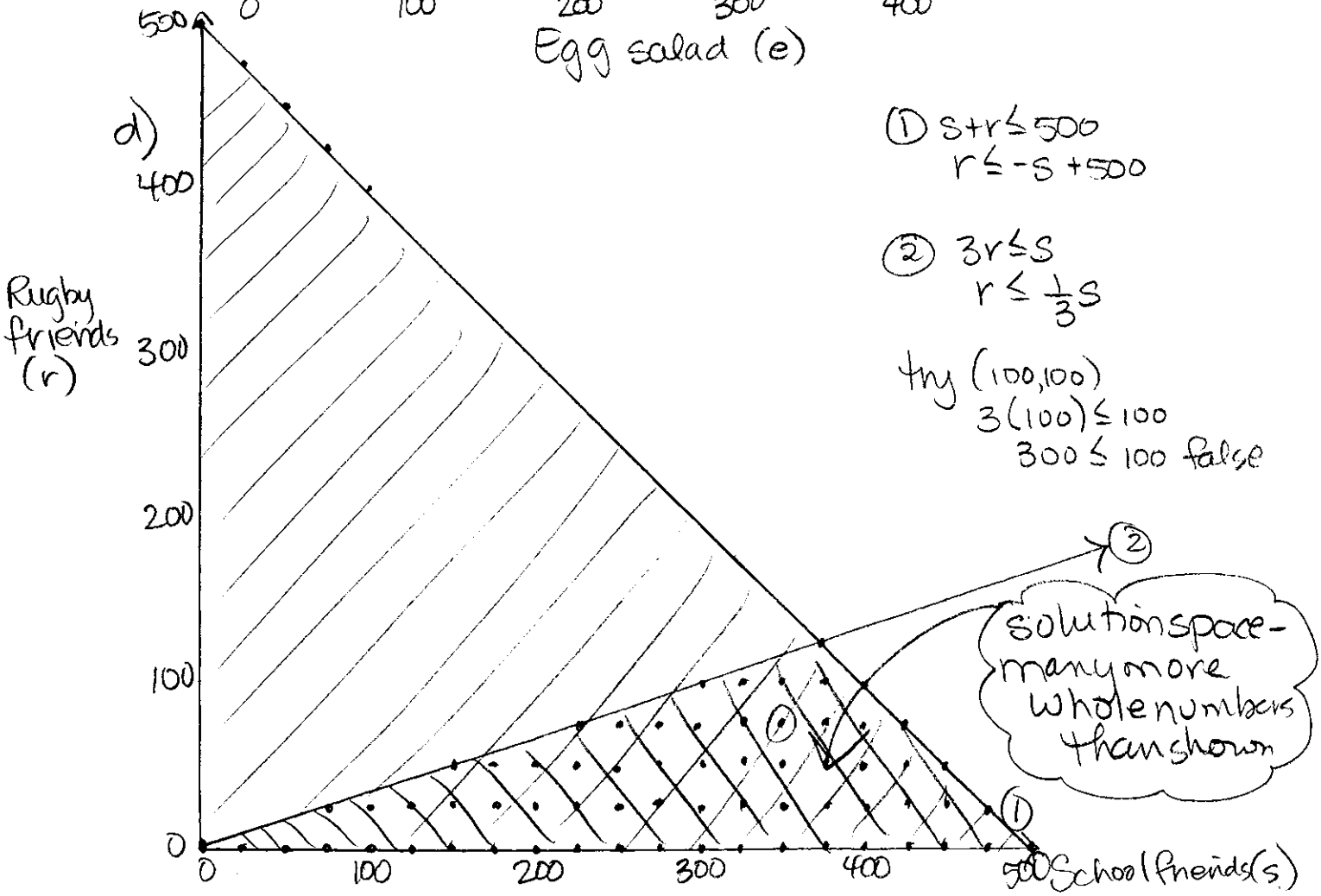
solution space - many more whole numbers than those shown

① $h + e \leq 450$
$h \leq -e + 450$

② $2e \leq h$

try (100, 100)
$2(100) \leq 100$
$200 \leq 100$ false

d)



① $s + r \leq 500$
$r \leq -s + 500$

② $3r \leq s$
$r \leq \frac{1}{3}s$

try (100, 100)
$3(100) \leq 100$
$300 \leq 100$ false

solution space - many more whole numbers than shown