Unit 4
Systems of Equations and Inequalities

*Section 3.6 Linear Systems

1*a*) $(1.8,-11.6)$

1*b*) $(3.7,31.9)$

2) *ex.* $\begin{cases} y = 7.5+4(x-2) \\ y = 7.5+3(x-2) \end{cases}$

3) $y = 5+0.4(x-1)$

4*a*) $x = \frac{32}{19} \approx 1.684$

4*b*) $t = -\frac{61}{3} \approx -20.33$

5*a*) $(4.125,-10.625)$

5*b*) $(-3.16,8.27)$

5*c*) *Same Line*

7*a*) No. At $x = 25$ cost is above income

7*b*) Yes. The Profit $\approx \$120$

7*c*) ≈ 120 pogo sticks. Lines intersect

8*a*) ≈ 2029 (2030 *Olympics*)

8*b*) Answers will vary

8*c*) *Men* $1: 42.3$, *Women* $1: 48$

8*d*) No, Answers will vary

11*a*) $\begin{cases} 2l+2w = 44 \\ l = 2+2w \end{cases}, w = \frac{20}{3} cm, l = \frac{46}{3} cm$

11*b*) $\begin{cases} 2l+b = 40 \\ b = l-2 \end{cases}, l = 14cm, b = 12cm$

11*c*) $\begin{cases} f = 3c-0.4 \\ f = 1.8c+32 \end{cases}, c = 27°C, f = 80.6°F$

*Section 3.7 Substitution and Elimination

1a) $w = 11 + r$ 1b) $h = 6 - \frac{2}{3}p$ 1c) $r = w - 11$ 1d) $p = 19 - \frac{3}{2}h$

3a) $(3.1, -1.8)$ 3b) $(1.0625, 3.34375)$ 3c) $(3, 2.333)$

3d) $\left(8, -\frac{5}{2}\right)$ 3e) $(-18, -49)$ 4a) inconsistent

4b) consistent and dependent 4c) consistent and independent

7a) $y = 47 + 11.5x$ 7b) ≈ 1.8 *yrs* 7c) ≈ 1.832 *yrs*

$y = 58 + 4.95x$ 7d) Answers will vary

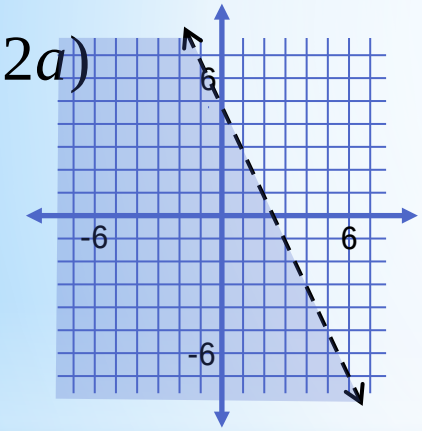
10a) $A = \frac{d^2}{2}$ 10b) $P = I^2R$ 10c) $A = \frac{C^2}{4\pi^2}$

Section 6.5a - Systems of Inequalities

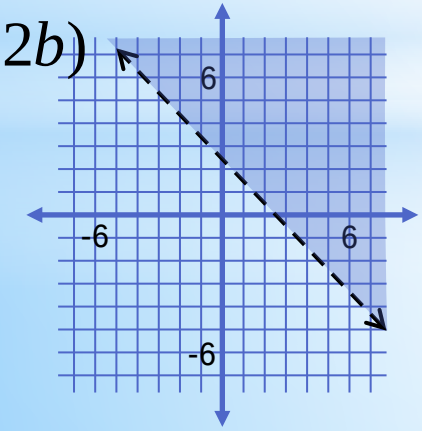
1a) $y < -2 + 0.4x$

1b) $y < -\frac{1}{2} + \frac{1}{6}x$

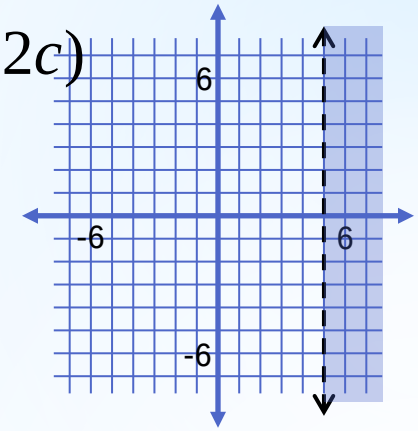
2a)



2b)



2c)



3a) $y < 2 - 0.5x$

3b) $y \geq 3 + 1.5x$

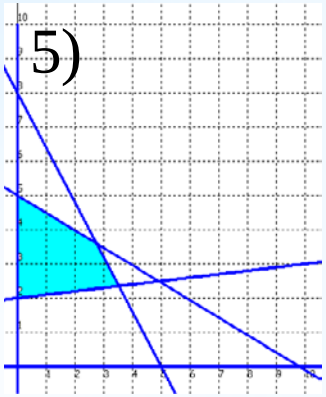
3c) $y > 1 - 0.75x$

3d) $y \leq 1.5 + 0.5x$

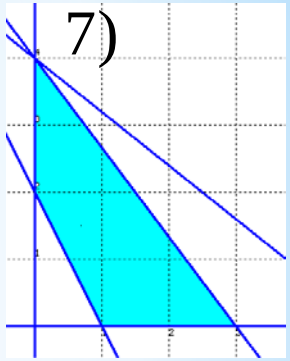
4) $y \geq 2.4x + 2$ *and*

$y \leq -x2 - 2x + 6.4$

5)

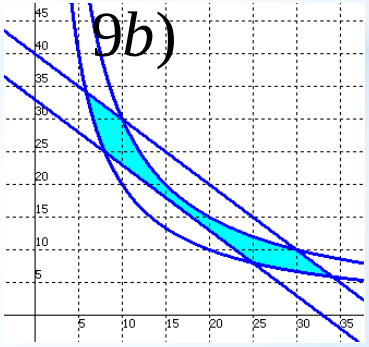


7)



9a) $\begin{cases} xy \geq 200 \\ xy \leq 300 \\ 2x + 2y \geq 66 \\ 2x + 2x \leq 80 \end{cases}$

9b)



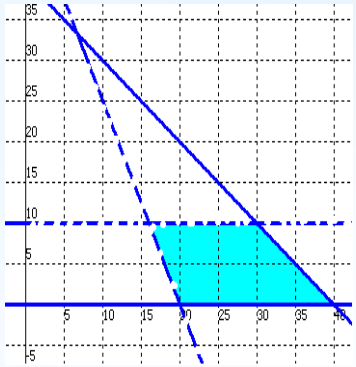
9c) *i – no*

ii – yes

iii – no

Section 6.5b - Systems of Inequalities

10*a*) $5x + 2y > 100$



10*b*) $y < 10$

10*c*) $x + y \le 40$

10*d*) $x \ge 0,\ y \ge 0$

10*e*) $(20,0),(40,0),(30,10),(16,10)$

11*a*) *above* $12{,}800$ *km*

11*b*) 159.45 *lb*

11c) According to the equation, w can never equal 0. The equation does not apply to freefall so in reality, yes.

15*a*) 2 *or* 3 *spores*

15*b*) $\approx 1{,}868{,}302$ *spores*

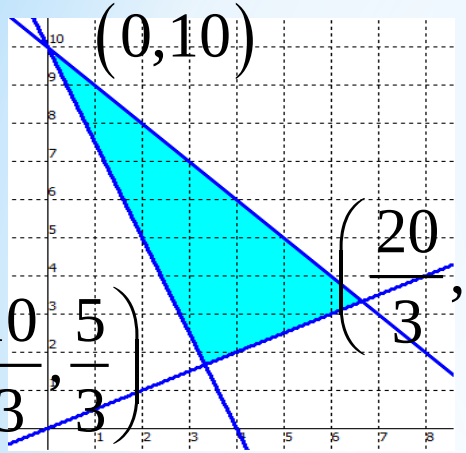
15*c*) $y = \dfrac{\log \dfrac{x}{2.68}}{\log 3.84}$

or $y = \log_{3.84}\left(\dfrac{x}{2.68}\right)$

15*d*) *after* $14\,hr\ 40\,\text{min}$

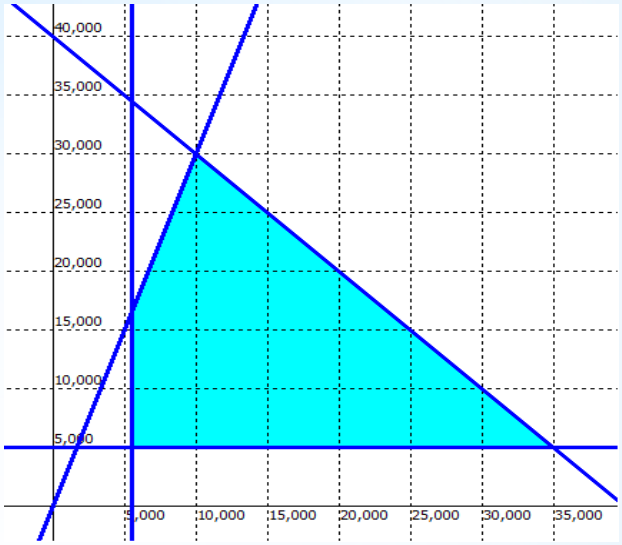
Section 6.6a - Linear Programming

1) $(0,10)$



$\left(\frac{10}{3},\frac{5}{3}\right)$ $\left(\frac{20}{3},\frac{10}{3}\right)$

3)



2a) $\left(\frac{20}{3},\frac{10}{3}\right)$ 2b) $\left(\frac{10}{3},\frac{5}{3}\right)$

2c) $(0,10)$ 2d) $(0,10)$

2e) It is not always obvious

verticies $(5500,5000)$, $(5500,165000)$, $(10000,30000)$, $(35000,5000)$

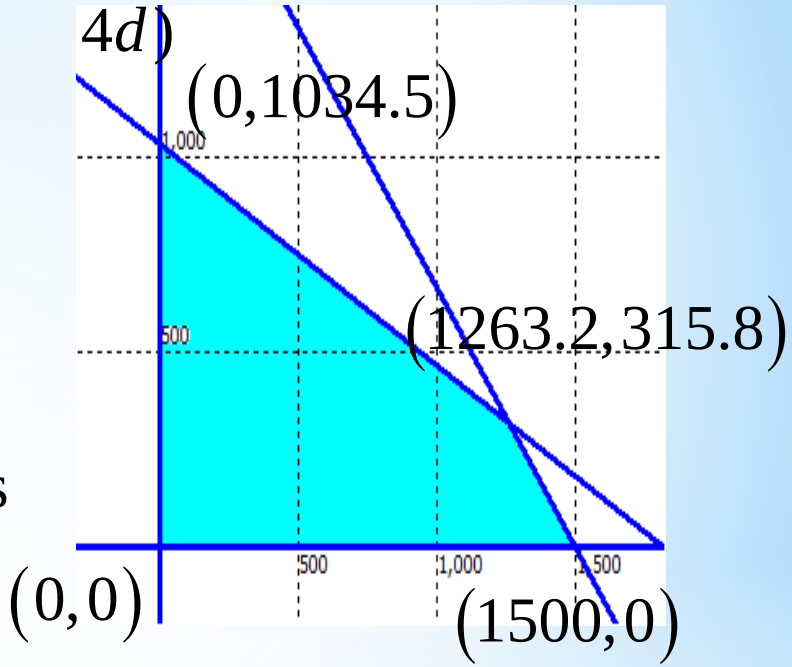
max 3800

Section 6.6b - Linear Programming

4a) There are zero or more pairs of each species in the region

4b) The area required by species X plus the area required by species Y is no more than 180,000 m^2

4c) The total food requirement of species X plus the total food requirement of species Y is no more than 72,000 kg.



4e) Maximum = 1578

6) 12 sled dogs and 12 poodles – max profit $3,3600

7) 5 radio min. and 10 Newspaper ads – max 155,000 people assume each radio minute and ad reach different people

Section 6.6c - Linear Programming

9) 6270 acres of coffee and 1230 acres of cocoa for a maximum total income of $327,327

$11a)\ x = -\frac{7}{11},\ y = \frac{169}{11}$

$11b)\ x = -3.5,\ y = 74,\ z = 31$

$15)\ y = -\left(\frac{x}{2}\right)^2 - \frac{3}{2},\ or\ \ y = -\frac{1}{4}x^2 - \frac{3}{2}$