Bounded
Unbounded
(0, 3) - (2, 1)

Bounded
Problem

4

\[ (\frac{4}{5}, 3) \]

\[ (0, 3) \]

\[ \left( \frac{12}{5}, \frac{7}{5} \right) \]

\[ (0, -1) \]

Bounded
Problem 6

\[ 3x + 2y \leq 10, \]
max value \( \frac{53}{5} \)
at \((x, y) = (3, \frac{4}{5})\)
Problem

\[ \text{intersect at (20, -5)} \]

\[
\begin{array}{c|c|c}
\text{Corner} & x & -x + 4y \\
\hline
10 & 5 & 10 \\
5 & \frac{15}{2} & 25 \max \\
-20 & -5 & 0 \min
\end{array}
\]
Corner pt.

Corner:

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
<th>( 2x - 5y )</th>
<th>( -x + 3y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>60 ( \text{max} )</td>
<td>-30 ( \text{min} )</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>-39 ( \text{min} )</td>
<td>33 ( \text{max} )</td>
</tr>
<tr>
<td>0</td>
<td>( \frac{135}{4} )</td>
<td>-( \frac{135}{4} )</td>
<td>27</td>
</tr>
</tbody>
</table>

\( \frac{135}{4} = 33 + \frac{3}{4} \)

Corner pt at \((30, 0)\)
Problem

Corner at

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>x - 3y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>3 max</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>-3</td>
</tr>
<tr>
<td>36</td>
<td>14</td>
<td>-6\frac{2}{5}</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
Problem 16

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>2x+y</th>
<th>2y-3x</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>7</td>
<td>-4 min</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>8</td>
<td>-5</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Points: (2,3), (1,2), (3,1), (3,2)
Problem 17

\[ 6(240 - 2y) + 10y = 1320 \]

\[ -2y = 1320 - 1440 = -120 \]

\[ y = 60 \]

\[ x = 120 \]

<table>
<thead>
<tr>
<th>Concepts</th>
<th>( x )</th>
<th>( y )</th>
<th>( 0.8x + 1.2y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>220</td>
<td>0</td>
<td>176</td>
<td>Max</td>
</tr>
<tr>
<td>120</td>
<td>60</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>120</td>
<td>144</td>
<td></td>
</tr>
</tbody>
</table>

Max profit of \$176 is made by making

220 small sandwiches,
0 large sandwiches
\[
\begin{align*}
5(8) + 2y &= 20 \\
\Rightarrow 4 + 2y &= 20 \\
\Rightarrow 2y &= 16 \\
\Rightarrow y &= 8
\end{align*}
\]
\[
\begin{align*}
5x + 2(46 - 2.5x) &= 20 \\
\Rightarrow -9.5x &= 20 - 92 \\
\Rightarrow -9.5x &= -72 \\
\Rightarrow x &= \frac{72}{9.5} = \frac{144}{9} = 16
\end{align*}
\]
\[
\begin{align*}
y &= \frac{40 - 16}{4} = \frac{24}{4} = 6
\end{align*}
\]
Max profit $122$

\[\text{Max profit: 122$} \]

From 16 batches Salad Deluxe
6 batches Daily Special
<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>7x + 5y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.7</td>
<td>700</td>
<td>3900</td>
</tr>
<tr>
<td>\frac{12800}{42}</td>
<td>\frac{23000}{42}</td>
<td>\frac{34100}{7} \text{ max}</td>
</tr>
<tr>
<td>480</td>
<td>0</td>
<td>3360</td>
</tr>
</tbody>
</table>

The diagram shows a coordinate system with lines indicating the equations:

- \(7x + 5y = 0\)
- \(7x + 5y = 3900\)
- \(7x + 5y = \frac{34100}{7}\) (max)

The points \((0, 0)\), \((480, 0)\), and \((0, 700)\) are marked on the diagram.
Problem 20

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>15x + 19y</th>
</tr>
</thead>
<tbody>
<tr>
<td>480</td>
<td>0</td>
<td>7200</td>
</tr>
<tr>
<td>288</td>
<td>288</td>
<td>9504 max</td>
</tr>
<tr>
<td>0</td>
<td>360</td>
<td>6480</td>
</tr>
</tbody>
</table>

Max profit $= 9504 \text{ \textdollar}$

288 Calif. skates per day
288 Florida skates per day
**Problem**

<table>
<thead>
<tr>
<th>Corner</th>
<th>$x_0$</th>
<th>$y$</th>
<th>$20x + 15y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>120</td>
<td>8000</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>120</td>
<td>9300</td>
<td></td>
</tr>
<tr>
<td>264</td>
<td>324</td>
<td>10,140 max</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>500</td>
<td>7500</td>
<td></td>
</tr>
</tbody>
</table>

Max profit $10,140$ at $264$ desks, $324$ filing cabinets.
Table: Corner

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>x+1.2y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>400</td>
<td>0</td>
<td>400</td>
</tr>
<tr>
<td>0</td>
<td>1000</td>
<td>1200 max</td>
</tr>
<tr>
<td>1000</td>
<td>5000</td>
<td>8200 ( \approx 1151 )</td>
</tr>
</tbody>
</table>

Max profit $1200 $

0 gal regular
1000 gal low cal
Problem 23

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>x + \frac{1}{2}y</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>180</td>
<td>13.2</td>
</tr>
<tr>
<td>6</td>
<td>200</td>
<td>14</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
<td>\frac{400}{3} = 14.67</td>
</tr>
</tbody>
</table>

Max info yield $\frac{400}{3}$ at $\frac{20}{3}$ subject hours

200 consultation minutes
<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
<th>$5x + 3y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1800</td>
<td>0</td>
<td>9000</td>
</tr>
<tr>
<td>1800</td>
<td>800</td>
<td>11400</td>
</tr>
<tr>
<td>1500</td>
<td>1400</td>
<td>11700 max</td>
</tr>
<tr>
<td>0</td>
<td>2000</td>
<td>6000</td>
</tr>
</tbody>
</table>

Max Profit of $11700$ from 1500 gal Extra Maple S, 1400 gal regular Maple S.
Max rate 27,000

Inoc/hr occurs at
150 full kams
0 half kams

Corner table:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>180x + 100y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td>0</td>
<td>27000 max</td>
</tr>
<tr>
<td>50</td>
<td>150</td>
<td>24000</td>
</tr>
<tr>
<td>0</td>
<td>200</td>
<td>20,000</td>
</tr>
</tbody>
</table>
Problem

Corner

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>15x + 21y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4500/114</td>
<td>0</td>
<td>15.4500</td>
</tr>
<tr>
<td>0</td>
<td>250</td>
<td>5250 max</td>
</tr>
</tbody>
</table>

Max profit of $5250\$ occurs for

0 Stars' bikes
250 SuperStars bikes
Max profit $675 occurs if

- 1250 standard containers
- 750 heavy duty containers
Max profit of $675 occurs at
1250 standard containers
750 heavy duty containers.

(same ans as fn #27)
Problem

29

<table>
<thead>
<tr>
<th></th>
<th>g</th>
<th>f</th>
<th>p</th>
<th>c</th>
<th>dollar profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poppy Seed</td>
<td>400</td>
<td>200</td>
<td>100</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>German Choc</td>
<td>600</td>
<td>100</td>
<td>0</td>
<td>150</td>
<td>4</td>
</tr>
<tr>
<td>Supply</td>
<td>9600</td>
<td>2400</td>
<td>1500</td>
<td>2100</td>
<td></td>
</tr>
</tbody>
</table>

x = # of poppy seed cakes made each day
y = # of German chocolate cakes made each day

Maximize

\[ 2x + 4y \]

subject to

\[ x \geq 0, \quad y \geq 0 \]
\[ 400x + 600y \leq 9600 \]
\[ 200x + 100y \leq 2400 \]
\[ 100x \leq 1500 \]
\[ 150y \leq 2100 \]
29 cmt.

<table>
<thead>
<tr>
<th>Corner pt</th>
<th>2x + 4y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0</td>
<td>0</td>
</tr>
<tr>
<td>12 0</td>
<td>24</td>
</tr>
<tr>
<td>6 12</td>
<td>60</td>
</tr>
<tr>
<td>3 14</td>
<td>62 (\leq) Max</td>
</tr>
<tr>
<td>0 14</td>
<td>56</td>
</tr>
</tbody>
</table>

(a) Max profit of $62 came from

3 Poppy Seed
14 German Chocolate

(b) No flour left

(c) 400g butter left \(2400 - 200(3) - 100(14)\)
\[= 400\]
### Problem

<table>
<thead>
<tr>
<th>Corner point</th>
<th>$x$</th>
<th>$y$</th>
<th>$3x + 4y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>0</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td></td>
<td>66</td>
</tr>
<tr>
<td>3</td>
<td>19</td>
<td></td>
<td>65</td>
</tr>
<tr>
<td>0</td>
<td>19</td>
<td></td>
<td>56</td>
</tr>
</tbody>
</table>

- **(a)** Max profit of $66 from 6 Poppy seed, 12 German choc
- **(b)** No flour left
- **(c)** No butter left
### Problem 31

<table>
<thead>
<tr>
<th>Corner</th>
<th>(x)</th>
<th>(y)</th>
<th>(x - 2y)</th>
<th>(x + 2y)</th>
<th>(x + 6y)</th>
<th>(-2x + y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4</td>
<td>-4</td>
<td>12 min</td>
<td>28</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>(\frac{2}{3})</td>
<td>(\frac{2}{3})</td>
<td>(\frac{2}{3})</td>
<td>(12)</td>
<td>(\frac{13.9}{3} = 4.6\frac{1}{3})</td>
<td>(\frac{8}{3}) max</td>
<td></td>
</tr>
<tr>
<td>(\frac{2}{3})</td>
<td>(\frac{2}{3})</td>
<td>(\frac{8}{3}) max</td>
<td>(12) min</td>
<td>(\frac{64}{3} = 21\frac{1}{3})</td>
<td>(\frac{37}{3})</td>
<td></td>
</tr>
<tr>
<td>Extra point</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>2</td>
<td>14</td>
<td>26</td>
<td>-13 min</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>-13 min</td>
<td>19</td>
<td>51</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

(a) No min, Max \(\frac{8}{3}\) at \((\frac{2}{3}, \frac{2}{3})\)

(b) Min at \((4, 4)\) or \((\frac{22}{3}, \frac{7}{3})\) No Max

(c) Min \(\frac{64}{3}\) at \((\frac{22}{3}, \frac{7}{3})\) No Max

(d) No min, Max \(\frac{8}{3}\) at \((\frac{7}{3}, \frac{22}{3})\)
Problem 32, cont

<table>
<thead>
<tr>
<th>8a</th>
<th>y</th>
<th>2x−y</th>
<th>−2x+3y</th>
<th>2y</th>
<th>−x</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9/2</td>
<td>−5/2 min</td>
<td>23/4</td>
<td>9</td>
<td>−1 max</td>
</tr>
<tr>
<td>3/2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2 min</td>
<td>−3/2</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>−2</td>
<td>14 max</td>
<td>12 max</td>
<td>−2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>5</td>
<td>−3 min</td>
<td>2</td>
<td>−3 min</td>
</tr>
</tbody>
</table>

Min
(a) −5/2 at (1,9/2)

Max
None

(b) None
None

(c) 2 at (3/2, 1)

None

(d) None
−1 at (1, 5/2) or (1, 5/2)
<table>
<thead>
<tr>
<th></th>
<th>Oz raisins</th>
<th>Oz peanuts</th>
<th>Oz apple</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Deluxe</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>2.5</td>
</tr>
<tr>
<td>Supply</td>
<td>384</td>
<td>576</td>
<td>960</td>
<td></td>
</tr>
</tbody>
</table>

\[ LL = 16 \text{ oz} \]

\[
\begin{array}{ccc}
\frac{2}{16} & \frac{3}{16} & \frac{60}{16} \\
\frac{24}{144} & \frac{36}{216} & \frac{360}{36} \\
\frac{144}{384} & \frac{216}{576} & \frac{360}{960}
\end{array}
\]

\[ x = \# \text{ boxes of Regular mix} \]
\[ y = \# \text{ boxes of Deluxe mix} \]

Maximize \[ 2x + 2.5y \]

Subject to

\[ x \geq 0 \quad y \geq 0 \]
\[ 4x + 6y \leq 384 \]
\[ 8x + 6y \leq 576 \]
\[ 12x + 8y \leq 960 \]
### Problem

<table>
<thead>
<tr>
<th>Corner pt</th>
<th>( x )</th>
<th>( y )</th>
<th>( 2x + \frac{5}{2}y )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>0</td>
<td>144</td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>32</td>
<td>176 max</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>64</td>
<td>160</td>
</tr>
</tbody>
</table>

Max Profit $176 from

48 regular

32 deluxe
<table>
<thead>
<tr>
<th>x</th>
<th>7</th>
<th>3x-2y</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>-4</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>-5 mm</td>
</tr>
</tbody>
</table>

No mm
\[
\begin{array}{c|c|c|c|c}
\text{X} & \text{Y} & 2x-10y & 2x-6y & 2x-8y \\
\hline
1 & 3 & -28 & -16 & -22 \\
\frac{16}{5} & \frac{4}{5} & -\frac{8}{5} \max & \frac{8}{5} & 0 \max \\
4 & 1 & -2 & 2 \max & 0 \max \\
2 & 7 & -66 & -38 & -52 \\
\end{array}
\]

(a) \( \max -\frac{8}{5} \at \left(\frac{16}{5}, \frac{4}{5}\right) \)

(b) No max

(c) \( \max 0 \at \left(\frac{16}{5}, \frac{4}{5}\right) \)
Problem 36.10

<table>
<thead>
<tr>
<th></th>
<th>y</th>
<th>x - 5y</th>
<th>x - 3y</th>
<th>x - y</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>6</td>
<td>-16</td>
<td>-4</td>
<td>8</td>
</tr>
<tr>
<td>28</td>
<td>2</td>
<td>18 max</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>18</td>
<td>12</td>
<td>-42</td>
<td>-18</td>
<td>6</td>
</tr>
<tr>
<td>36</td>
<td>4</td>
<td>16</td>
<td>24 max</td>
<td>32 max</td>
</tr>
</tbody>
</table>

(a) Max 18 at x = 28, y = 2

(b) No max

(c) No max.
<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>2x+y</th>
<th>x+y</th>
<th>x−y</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>-6</td>
<td>12</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>11</td>
<td>-9</td>
<td>13</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>14</td>
<td>-1</td>
<td>24</td>
<td>13</td>
<td>15</td>
</tr>
</tbody>
</table>

(a) Min 12 occurs at \( x=9, \ y=-6 \)
(b) \( \text{No min} \)
(c) Min 10 occurs at \( x=10, \ y=0 \)
Problem

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>x-y</th>
<th>x-3y</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>6</td>
<td>0</td>
<td>-12</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>20</td>
<td>20 max</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>-3 min</td>
<td>-25 min</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>21 max</td>
<td>19</td>
</tr>
</tbody>
</table>

(a) No Max No Min

(b) Max 20 at x = 20, y = 0

No Min