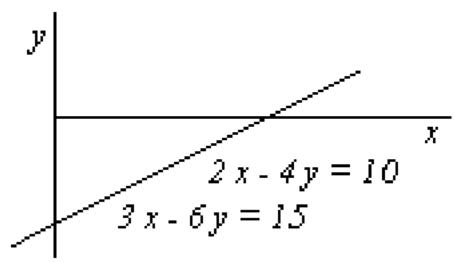
3.51(d)

1 3.51(d), §1 Asked

Asked: Solve

$$\begin{array}{rcrcrl} 2x & - & 4y & = & 10 & \quad (1) \\ 3x & - & 6y & = & 15 & \quad (2) \end{array}$$

2 3.51(d), §2 Graphically



One complete line of solution points $y = -2.5 + 0.5x$

3 3.51(d), §3 Elimination

Gaussian elimination:

$$\begin{array}{rcrcrl} 2x & - & 4y & = & 10 & \quad (1) \\ 3x & - & 6y & = & 15 & \quad (2) \end{array}$$

A. Forward Elimination:

Use (1) to eliminate x from (2):

$$\begin{array}{rcrcrl} 2x & - & 4y & = & 10 & \quad (1) \\ & & 0 & = & 0 & \quad (2') = 2(2) - 3(1) \end{array}$$

The second equation is trivial.

B. Back Substitution:

Solve (1) to find $x = 5 + 2y$. y can be anything, but for each possible y there is only one corresponding x.

4 3.51(d), §4 Matrix Form

$$\begin{array}{rcrcrl} 2x & - & 4y & = & 10 & \quad (1) \\ 3x & - & 6y & = & 15 & \quad (2) \end{array}$$

Rewritten:

$$\left(\begin{array}{cr|c} 2 & -4 & 10 \\ 3 & -6 & 15 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2) \end{array}$$

After elimination:

$$\left(\begin{array}{cr|r} 2 & -4 & 10 \\ 0 & 0 & 0 \end{array}\right) \qquad \begin{array}{l} (1) \\ (2') = 2(2) - 3(1) \end{array}$$

5 3.51(d), §5 Determinant

$$|A| = \left|\begin{array}{cr} 2 & -4 \\ 3 & -6 \end{array}\right| = 2\,(-6) - 4\,(-3) = 0$$