$$\left[\begin{array}{ccc|c} x & y & z & c \\ 1 & 2 & 3 & 1 \\ 1 & -1 & 1 & 1 \end{array}\right] \sim \left[\begin{array}{ccc|c} 1 & 2 & 3 & 1 \\ 0 & -3 & -2 & 0 \end{array}\right] \qquad \begin{array}{l} x+2y+3z=1 \\ -3y-2z=0 \end{array}$$

$$\begin{array}{ll} E1 & x+2y+3z=1 \\ E2 & x-y+z=1 \end{array} \qquad \begin{array}{ll} -E1 & -x-2y-3z=-1 \\ E2 & x-y+z=1 \\ \hline -E1+E2: & -3y-2z=0 \end{array}$$

New system:

E1 $x+2y+3z=1$ is triangular.

E2 $-3y-2z=0$ Back-substitute from

$$-3y-2z=0$$
$$-3y=2z$$
$$y=-\frac{2}{3}z$$

$$E1 \quad x+2\left(-\frac{2}{3}z\right)+3z=1$$
$$x-\frac{4}{3}z+3z=1$$
$$x+\frac{5}{3}z=1$$
$$x=1-\frac{5}{3}z$$

z is free!

$$\left\{\left(-\frac{5}{3}z+1, -\frac{2}{3}z, z\right) \mid z \in \mathbb{R} \text{ is free}\right\}$$

$t=z$

$$=\left\{\left(-\frac{5}{3}t+1, -\frac{2}{3}t, t\right) \mid t \in \mathbb{R}\right\}$$

$x=-\frac{5}{3}t+1, y=-\frac{2}{3}t, z=t$ are parametric eqns of the line of intersection

11 12 13 14 15 16 17 18

Ex. Score: 0 of 1 pt HW Score: 0%

5.2.61

The sum of three numbers is 11. The sum of twice the first number, 5 times the second number, and 6 times the third number is 57. The difference between 5 ? times the first number and the second number is 9. Find the three numbers.

$x = 1^{st}$ #
$y = 2^{nd}$ #
$z = 3^{rd}$ #

$x + y + z = 11$
$2x + 5y + 6z = 57$
$5x - y = 9$

$$\begin{array}{rcl} x + y + z &=& 11 \\ 2x + 5y + 6z &=& 57 \\ 5x - y &=& 9 \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 11 \\ 2 & 5 & 6 & 57 \\ 5 & -1 & 0 & 9 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} a & b & c & d \\ e & f & g & h \\ i & j & k & l \end{array}\right] \quad \frac{1}{a}R_1$$

$$\sim \left[\begin{array}{ccc|c} 1 & * & * & * \\ e & f & g & h \\ i & j & k & l \end{array}\right] \quad -eR1 + R2, \; -iR1 + R3$$

$$\sim \left[\begin{array}{ccc|c} 1 & * & * & * \\ 0 & m & n & o \\ 0 & p & q & r \end{array}\right] \quad \frac{1}{m}R_2$$

$$\sim \left[\begin{array}{ccc|c} 1 & * & * & * \\ 0 & 1 & * & * \\ 0 & p & q & r \end{array}\right] \quad -pR_2 + R3$$

$$\sim \left[\begin{array}{ccc|c} 1 & * & * & * \\ 0 & 1 & * & * \\ 0 & 0 & s & t \end{array}\right]$$

Triangular. Back substitute

$$\sim \left[\begin{array}{ccc|c} 1 & * & * & * \\ 0 & 1 & * & * \\ 0 & 0 & 1 & u \end{array}\right]$$

$z = u$

$-iR_2 + eR_3$

$\frac{1}{3} + \frac{1}{4}$

$= \frac{4+3}{12}$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 11 \\ 2 & 5 & 6 & 57 \\ 5 & -1 & 0 & 9 \end{array}\right] \sim \left[\begin{array}{ccc|c} 1 & 1 & 1 & 11 \\ 0 & 3 & 4 & 35 \\ 0 & -6 & -5 & -46 \end{array}\right] \overset{m_1}{\sim} \left[\begin{array}{ccc|c} 1 & 1 & 1 & 11 \\ 0 & 1 & \frac{4}{3} & \frac{35}{3} \\ 0 & -6 & -5 & -46 \end{array}\right]$$

$$\overset{m_2}{\sim} \left[\begin{array}{ccc|c} 1 & 1 & 1 & 11 \\ 0 & 6 & 8 & 70 \\ 0 & -6 & -5 & -46 \end{array}\right] \sim \left[\begin{array}{ccc|c} 1 & 1 & 1 & 11 \\ 0 & 3 & 4 & 35 \\ 0 & 0 & 3 & 24 \end{array}\right]$$

$3z = 29$

$z = \frac{29}{3}$ ugh!

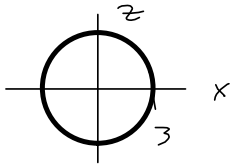
$3z = 24$

$z = 8$ etc.

Table 1, Page 877 is something you want to drill and kill on, so your intuition muscles are big, and you can recognize shapes in 3-D from the equations.

$x^2 + z^2 = 9$ (No y in here!) Cylinder

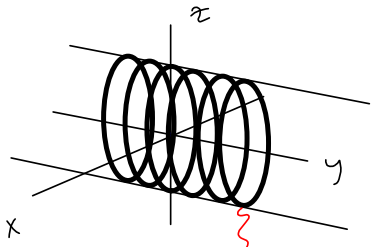
Plot in xz-plane



y=0 plane

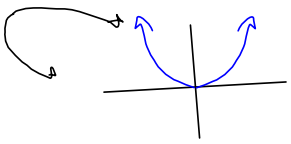
y=1 plane?

A bunch of circles marching down the y-axis



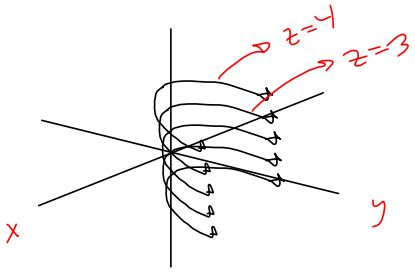
Trace of y=7 plane.

$y = x^2$ in $\mathbb{R}^3$



z=0 plane is xy-plane

z=1, z=2 planes, etc.



a though standing on end?

S12.6 Assignment, coming in e-mail this wknd.