Solutions to Quiz #1 – MATH 2421
Fall 2005

Kawai/Gould

1. In 3-D, the distance formula is an extended form of the Pythagorean Theorem.

$$\begin{aligned} d\{(2,-3,5),(0,3,2)\} &= \sqrt{(0-2)^2+(3-(-3))^2+(2-5)^2} \\ &= \sqrt{4+36+9} = \sqrt{49} = 7.\checkmark \end{aligned}$$

2. Equations.

   (a) Give the equation of the xy-plane in 3-D.
   This is $z = 0$.

   (b) Give the equation of the plane which 3 units left of the xz-plane (and parallel to it).
   It must be $y =$ a constant. This is $y = -3$.

3. Complete the square.

   Find the center $C(x_0, y_0, z_0)$ and radius of this sphere.

$$\begin{aligned} x^2-8x+y^2+z^2+2z &= 8 \\ x^2-8x+(-4)^2+y^2+z^2+2z+(1)^2 &= 8+16+1 \\ (x-4)^2+(y-0)^2+(y+1)^2 &= 25 = 5^2. \end{aligned}$$

   The center is located at $C(4,0,-1)$ and the radius is 5.

4. The solid box.

   The origin is located in the back left-hand corner of the bottom of the box.

   The positive x-axis points out of the paper. The positive y-axis points to the right.

   (a) According to the Right-Hand Rule, in what direction must the positive z-axis point?
   UPWARD.

   (b) Using the clues in the picture, what are the (x, y, z) coordinates of the corner point A?
   In order to arrive at A, we must go 1 unit forward, 2 units to the right, and 3 units up.
   Thus, the rectangular coordinates must be $(1, 2, 3)$.

   (c) Write THREE inequalities which describe all the points in this solid box.
   The box is bounded by the planes $x = 0$ (in back) and $x = 1$ (in front), so we must have the condition $0 \le x \le 1$. Similarly, we have the other two inequalities, $0 \le y \le 2$ and $0 \le z \le 3$.