1. Work the following problems from the text:

   (a) Section 10.4: 38, 42, 49, 53
   (b) Section 10.5: 29, 34, 42, 44

2. Let \((-1, 5, -2), (-3, 7, 2),\) and \((1, 3, 6)\) be 3 vertices of a cube. Determine the coordinates of the center of the cube.

3. Consider the four points: \((-1, -4, 1), (-1, 1, 2), (1, -1, 0), (2, 1, -1).\)

   (a) Draw the shape.
   (b) Find the total surface area of the object.
   (c) Reflect the point \((-1, -4, 1)\) across the plane defined by the points \((1, -1, 0), (2, 1, -1), (-1, 1, 2).\)
   (d) What is the surface area of the new shape? (Hint: you don’t need to recalculate surface areas).

4. One calculation that you will see later in this course is the mass flux, \(\dot{m}\) (with units of mass per unit time), of a fluid across a surface. (You might imagine the surface to be a screen so the fluid can pass right through the surface.) Here we will consider a simple case of a planar surface with area \(A\) and unit normal vector \(\hat{n}\). The fluid has mass density \(\rho\) with units of mass per unit volume, and velocity vector \(V\). Later, you will find that for this simple case the mass flux can be calculated by \(\dot{m} = \rho A V \cdot \hat{n}\).

   (a) If the velocity vector is \(V = 1\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}\), calculate the outward mass flux across each of the six surfaces of the finite object in the first octant bounded by \(x = 0, y = 0, z = 0,\) and \(x = 1, y = 2, z = 3.\)
   (b) What is the total outward mass flux across all six bounding surfaces of the object?
   (c) How should one interpret total outward mass flux values that are greater than zero? Equal to zero? Less than zero?