Homework for 12.1 and 12.2

- 12.1, number 1: Give a geometric description of the set of points in 3-space which satisfy $x = 2$ and $y = 3$.
- 12.1, number 5: Give a geometric description of the set of points in 3-space which satisfy $x^2 + y^2 = 4$ and $z = 0$.
- 12.1, number 9: Give a geometric description of the set of points in 3-space which satisfy $x^2 + y^2 + z^2 = 1$ and $x = 0$.
- 12.1, number 13: Give a geometric description of the set of points in 3-space which satisfy $x^2 + y^2 = 4$ and $z = y$.
- 12.1, number 15: Give a geometric description of the set of points in 3-space which satisfy $y = x^2$ and $z = 0$.
- 12.1, number 19: Describe the set of points in 3-space whose coordinates satisfy
  (a) $x^2 + y^2 + z^2 \leq 1$,
  (b) $x^2 + y^2 + z^2 > 1$.
- 12.1, number 23: Describe the set of points in 3-space whose coordinates satisfy
  (a) $y \geq x^2$ and $z \geq 0$
  (b) $x \leq y^2$ and $0 \leq z \leq 2$.
- 12.1, number 35b: Describe the plane perpendicular to the y-axis at $(0, -1, 0)$ with either one equation or two equations.
- 12.1 number 39: Describe each of the following circles in three space with either one equation or two equations. Each circle has radius two and center $(0, 2, 0)$.
  (a) This circle lies in the xy-plane.
  (b) This circle lies in the yz-plane.
  (c) This circle lies in the plane $y = 2$.
- 12.1, number 43: Describe the following circle using either one equation or two equations. The circle is the set of points which are on the plane through the point $(1, 1, 3)$ perpendicular to the z-axis and also are on the sphere of radius 5 centered at the origin.
- 12.1, number 45: Use inequalities to describe the slab bounded by the planes $z = 0$ and $z = 1$. (The planes are included.)

- 12.1, number 53: Find the center and radius for the sphere $(x-\sqrt{2})^2+(y-\sqrt{2})^2+(z+\sqrt{2})^2=2$.
- 12.1, number 57: Find the center and radius for the sphere $2x^2+2y^2+2z^2+x+y+z=9$.
- 12.1, number 65: Find the distance from the point $P=(x,y,z)$ to
  (a) the x-axis,
  (b) the y-axis, and
  (c) the z-axis.
- 12.1, number 67: Find the perimeter of the triangle with vertices $A=(-1,2,1)$, $B=(1,-1,3)$, and $C=(3,4,5)$.
- 12.1, number 69: Find an equation for the set of all points equidistant from the planes $y=3$ and $y=-1$.
- 12.2, number 9: What is the vector $\overrightarrow{PQ}$ for $P=(1,3)$ and $Q=(2,-1)$?
- 12.2, number 17: What is the vector $\overrightarrow{PQ}$ for $P=(5,7,-1)$ and $Q=(2,9,-2)$?
- 12.2, number 23.a: Draw $\vec{\boldsymbol{u}}+\vec{\boldsymbol{v}}$, where $\vec{\boldsymbol{u}}=-\vec{\boldsymbol{i}}+\vec{\boldsymbol{j}}$ and $\vec{\boldsymbol{v}}=2\vec{\boldsymbol{i}}$. (Actually, problem just drew the vectors. I made up the numbers.)
- 12.2 number 25: Express $2\vec{\boldsymbol{i}}+\vec{\boldsymbol{j}}-2\vec{\boldsymbol{k}}$ as a number times a unit vector.
- 12.2 number 31d: Find a vector of length 7 that points in the same direction as $\vec{\boldsymbol{u}}=\frac{6}{7}\vec{\boldsymbol{i}}-\frac{2}{7}\vec{\boldsymbol{j}}+\frac{3}{7}\vec{\boldsymbol{k}}$.
- 12.2 number 33: Find a vector of length 7 that has the same direction as $\vec{\boldsymbol{v}}=12\vec{\boldsymbol{i}}-5\vec{\boldsymbol{k}}$.
- 12.2 number 35: Let P_1 and P_2 be the points $P_1=(-1,1,5)$ and $P_2=(2,5,0)$.
  (a) Find a unit vector that points in the same direction as $\overrightarrow{P_1P_2}$.
  (b) Find the midpoint of the line segment from P_1 to P_2.