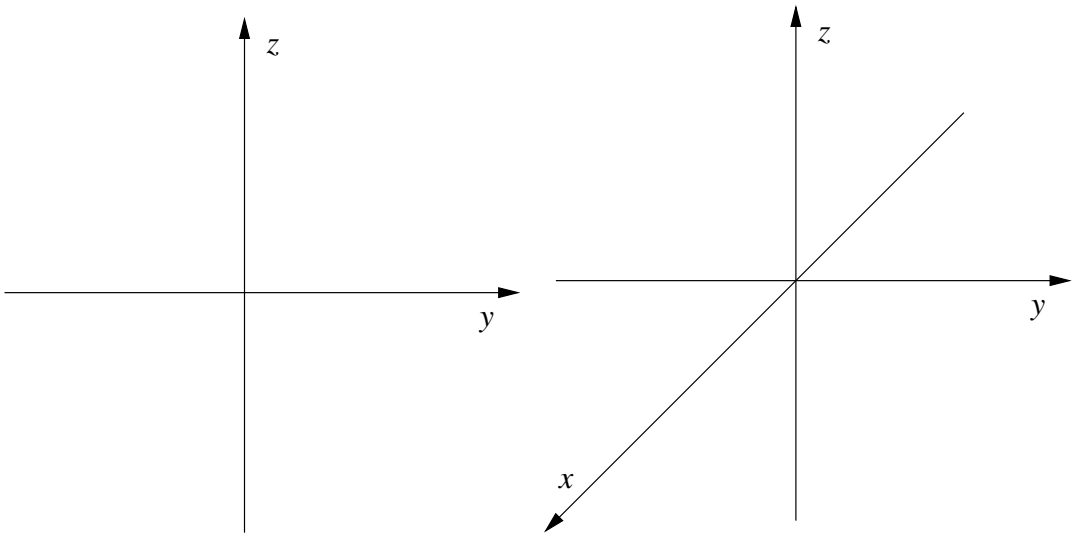
Sample Exam 1
Math 32, Fall 2015

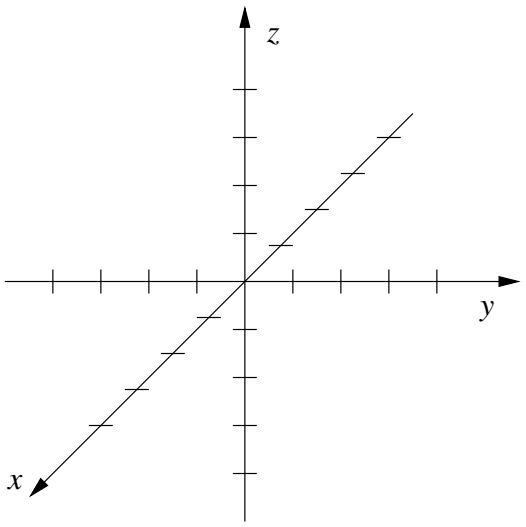
1. (14 points)

(a) On the 2-dimensional yz-axes below, sketch the graph of the equation $z = y^3$.

(b) On the 3-dimensional xyz-axes below, sketch the graph of the equation $z = y^3$, and briefly (1 sentence) describe how the graph in this part of the question relates to your answer in part (a). (If your drawing is a little messy, you can make up for it with your sentence, and vice versa.)



2. (14 points) On the 3-dimensional xyz-axes below, graph the point $(-2, 3, -4)$, making sure to follow the indicated scale (one hash mark = one unit).



3. (20 points) Let $\mathbf{a} = \langle 2, -4, 3 \rangle$ and $\mathbf{b} = \langle -3, 1, 2 \rangle$.

(a) Find the cosine of the angle θ between $\mathbf{a}$ and $\mathbf{b}$. No explanation necessary, but show all your work. Do not simplify your answer.

(b) Is $\mathbf{a}$ orthogonal to the vector $\langle 3, 2, 0 \rangle$? Briefly **explain** your answer.

4. (14 points) Find an equation for the plane that passes through the point $(2, 5, -7)$ and is perpendicular to the line with equation

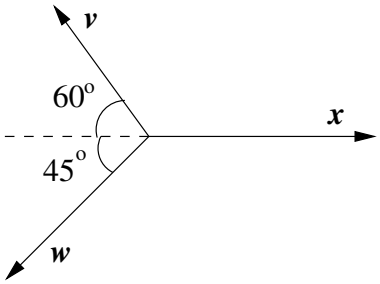
$$\mathbf{r}(t) = \langle 3, -1, 4 \rangle + t \langle 7, 3, -1 \rangle .$$

No explanation necessary, but show all your work. Do not simplify your final answer.

5. (14 points) Find an equation for the plane that passes through the points $(0, 1, 2)$, $(4, -1, 1)$, and $(3, -2, 1)$. No explanation necessary, but show all your work. Do not simplify your final answer.

6. (6 points) Find a unit vector in the same direction as $\langle 1, -3, 7 \rangle$. No explanation necessary, but show all your work. Do not simplify your final answer.

7. (18 points) Consider the vectors $\mathbf{v}$, $\mathbf{w}$, and $\mathbf{x}$ shown in the diagram below. The sizes of the vectors are not to scale, but assume that the angles are accurate as shown.



Suppose that $\mathbf{v} + \mathbf{w} + \mathbf{x} = \mathbf{0}$ and $|\mathbf{v}| = 10$.

(a) Find the components of $\mathbf{v}$, i.e., express $\mathbf{v}$ in the form $\mathbf{v} = \langle a, b \rangle$, where a and b are numbers. No explanation necessary, but show all your work.

(b) Let $w = |\mathbf{w}|$. Find the components of $\mathbf{w}$ in terms of w (i.e., your answer should still have a w in it). No explanation necessary, but show all your work.

(c) Using the fact that $\mathbf{v}+\mathbf{w}+\mathbf{x} = \mathbf{0}$, solve for w. (Suggestion: Consider the y components of $\mathbf{v}$, $\mathbf{w}$, and $\mathbf{x}$.)