NULL SPACE AND GEOMETRY

Return to thinking of the matrix-vector product as a function from $\mathbb{R}^n$ to $\mathbb{R}^m$ given an $m \times n$ matrix.

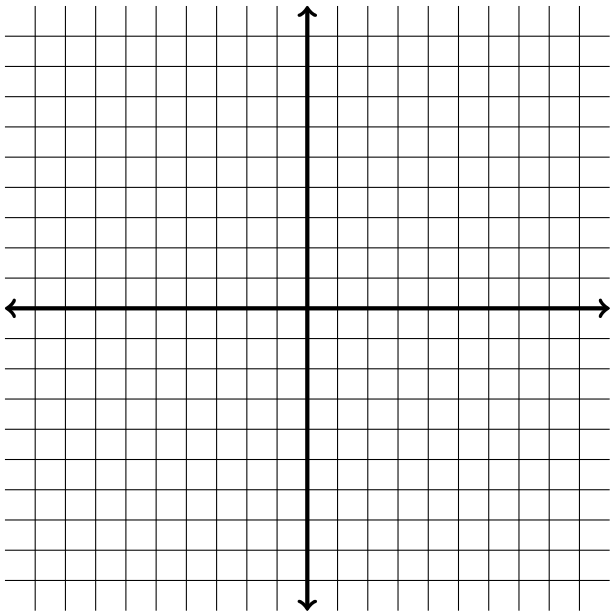
1. Example 1: Let $A = \begin{bmatrix} 1 & 2 \\ 10 & 20 \end{bmatrix}$ and $f(x) = Ax$.

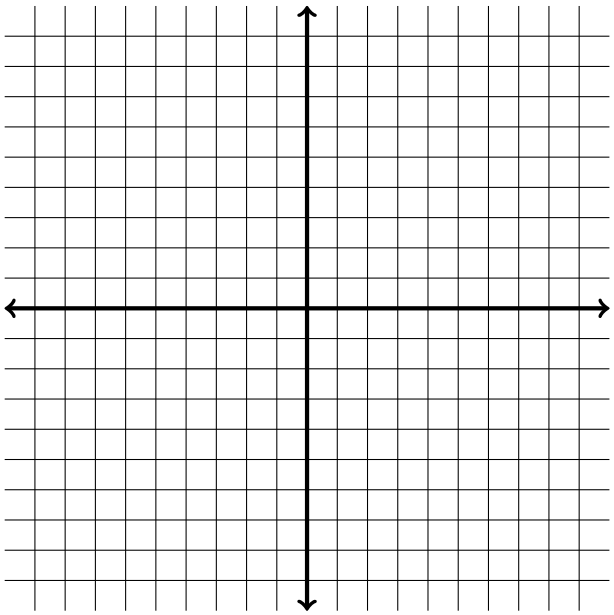
   (a) State $N(A)$. (Recall that we did this on the previous sheet.)

   (b) Find the image of the vectors below under f.

      i. $v = (2, -1)$, $e_1 = (1, 0)$, $e_2 = (0, 1)$

   (c) Graph the vectors on the left and their images under f on the right. (Note, I wouldn't chose the same scale on the left as on the right!)





2. Example 2: $B = \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$ and $g(x) = Bx$.

(a) State $N(B)$

(b) Find the image of the vectors below under g.

i. $v = (2, -1),\ e_1 = (1, 0),\ e_2 = (0, 1)$

(c) Graph the vectors on the left and their images under g on the right.