Math 54 Worksheet 5
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2/4/04

1. Describe the span of the vectors in $\mathbb{R}^2$.
   (a) $(1, 0)$ and $(1, 1)$
   (b) $(2, 3)$ and $(4, 6)$
   (c) $(1, 0)$ and $(0, 1)$
   (d) $(1, -1)$
   (e) $(1, -1)$, $(-2, 2)$ and $(0, 0)$
2. Describe the span of the vectors in $\mathbb{R}^3$.
   (a) $(0, 0, 1)$ and $(0, 1, 1)$
   (b) $(0, 0, 1)$, $(0, 1, 1)$ and $(1, 1, 1)$
   (c) $(1, 2, 3)$ and $(3, 2, 1)$
   (d) $(1, 2, 3)$, $(3, 2, 1)$ and $(10, 10, 10)$
   (e) $(1, 1, 1)$, $(-1, -1, -1)$ and $(5, 5, 5)$
3. Is it possible for one vector to span all of $\mathbb{R}^2$? Why or why not?
4. Is it possible for two vectors to span all of $\mathbb{R}^3$? Why or why not?

Bonus Problem (turn in on Monday for extra credit on the most recent quiz): Let

$$A = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 0 & 0 & 1 & 3 & 6 & 10 & 15 & 21 \\ 0 & 0 & 0 & 1 & 4 & 10 & 20 & 35 \\ 0 & 0 & 0 & 0 & 1 & 5 & 15 & 35 \\ 0 & 0 & 0 & 0 & 0 & 1 & 6 & 21 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 7 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}.$$

This matrix is called *Pascal's triangle*, and it is defined by the equations

$$a_{11} = a_{12} = \ldots = a_{18} = 1$$

$$a_{21} = a_{31} = \ldots = a_{81} = 0$$

$$a_{ij} = a_{i,j-1} + a_{i-1,j-1}, \qquad \text{if } i \text{ and } j \text{ are} > 1.$$

Find A^{-1}.