

1. The matrix  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$  is called the  $2 \times 2$  **identity matrix**.

Have it act on a few vectors (by multiplying) to see what it does to them.

2. We will call the action of the matrix  $S = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$  a **scaling**. Have it act on a few vectors (by multiplying) to see what it does to them.

3. A scaling other than the identity changes the direction of
  - (a) no vectors
  - (b) most, but not all, vectors
  - (c) all vectors
4. Using the same choices as for Exercise 2, a reflection changes the direction of ...
5. Using the same choices as for Exercise 2, a rotation (other than ...  
−360, 0, 360, 720, ... degrees) changes the direction of ...
6. Using the same choices as for Exercise 2, a projection changes the direction of ...

7. A reflection changes the magnitude (length) of
- (a) no vectors
  - (b) most, but not all, vectors
  - (c) all vectors
8. Using the same choices as for Exercise 2, a rotation (other than ...  
−360, 0, 360, 720, ... degrees) changes the magnitude of ...
9. Using the same choices as for Exercise 2, a scaling changes the  
magnitude of ...
10. Using the same choices as for Exercise 2, a projection changes the  
magnitude of ...

11. Which of the following can act on a nonzero vector and result in the zero vector?
- (a) a rotation by an angle that is not a multiple of 360 degrees
  - (b) a scaling other than zero or the identity
  - (c) a projection
  - (d) a reflection
12. Using the same choices as above, which will change neither the direction nor the magnitude of some vectors?