**Exercise** 1 Consider the vector  $\overrightarrow{\mathbf{u}} = \langle a, a-1 \rangle$ .

For how many values of a does the vector  $\overrightarrow{\mathbf{u}} = \langle a, a-1 \rangle$  have magnitude  $\sqrt{5}$ ?

Multiple Choice:

- (a) 0
- (b) 1
- (c) 2 ✓
- (d) 3
- (e) more than three, but finitely many
- (f) infinitely many

The values of a for which  $|\overrightarrow{\mathbf{u}}| = \sqrt{5}$  are  $a = \boxed{-1}$  and  $a = \boxed{2}$ . (type the smaller of the values first)

**Hint:** The magnitude of  $\overrightarrow{\mathbf{u}}$  in terms of a is:

$$|\overrightarrow{\mathbf{u}}| = \sqrt{a^2 + (a-1)^2}$$

Setting  $|\overrightarrow{\mathbf{u}}| = \sqrt{5}$  and squaring both sides gives:

$$5 = a^2 + (a-1)^2$$

After a little algebra, this gives a quadratic equation:

$$\boxed{2}a^2 + \left(\boxed{-2}\right)a + \left(\boxed{-4}\right) = 0$$

This can be factored, and the roots are  $a = \boxed{-1}$  and  $a = \boxed{2}$ . (type the smaller root first)