$\boxed{b}$ $A = \begin{pmatrix} a & b \\ -b & a \end{pmatrix}$

$\triangleright$ Let's solve the eigen problem...

$Ax = \lambda x$ $\qquad$ $Ax - \lambda x = 0$

$\begin{cases} ax_1 + bx_2 = \lambda x_1 \\ -bx_1 + ax_2 = \lambda x_2 \end{cases} \Rightarrow \begin{cases} (a-\lambda)x_1 + bx_2 = 0 \\ -bx_1 + (a-\lambda)x_2 = 0 \end{cases}$

so...

$\det \begin{pmatrix} a-\lambda & b \\ -b & a-\lambda \end{pmatrix} = 0 \Rightarrow \lambda = \frac{-(-2a) \pm \sqrt{(-2a)^2 - 4(1)(a^2+b^2)}}{2(1)}$

$(a-\lambda)^2 + b^2 = 0$

$\lambda^2 - 2a\lambda + (a^2+b^2) = 0$

$\lambda = \frac{2a \pm 2\sqrt{-b^2}}{2}$

$\lambda = a \pm ib$

the eigen values are:

$\lambda_1 = a - ib$

for $\lambda = \lambda_1$, then the eigenvector is

$\begin{cases} (a-(a-ib))x_1 + bx_2 = 0 \\ -bx_1 + (a-(a-ib))x_2 = 0 \end{cases}$

$ix_1 + x_2 = 0$

$x_1 = ix_2$

$i(ix_2) + x_2 = 0$

$x_2 = x_2$

$x = t\begin{pmatrix} i \\ 1 \end{pmatrix}$

$\lambda_2 = a + ib$

for $\lambda = \lambda_2$, then the eigen vector is

$\begin{cases} (a-(a+ib))x_1 + bx_2 = 0 \\ -bx_1 + (a-(a+ib))x_2 = 0 \end{cases}$

$-ix_1 + x_2 = 0$

$x_1 = -ix_2$

$-i(-ix_2) + x_2 = 0$

$x_2 = x_2$

$x = t\begin{pmatrix} -i \\ 1 \end{pmatrix}$