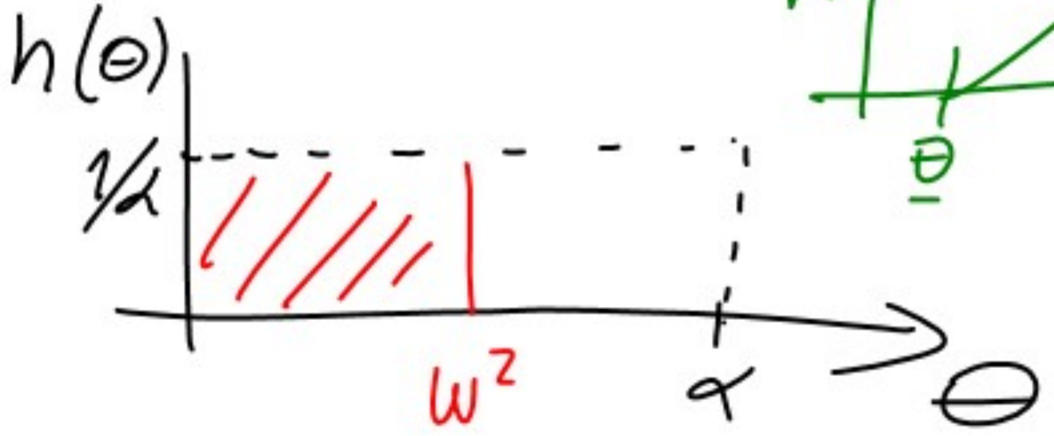
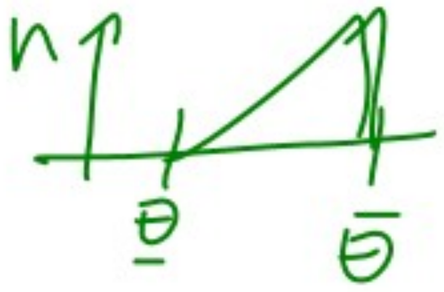
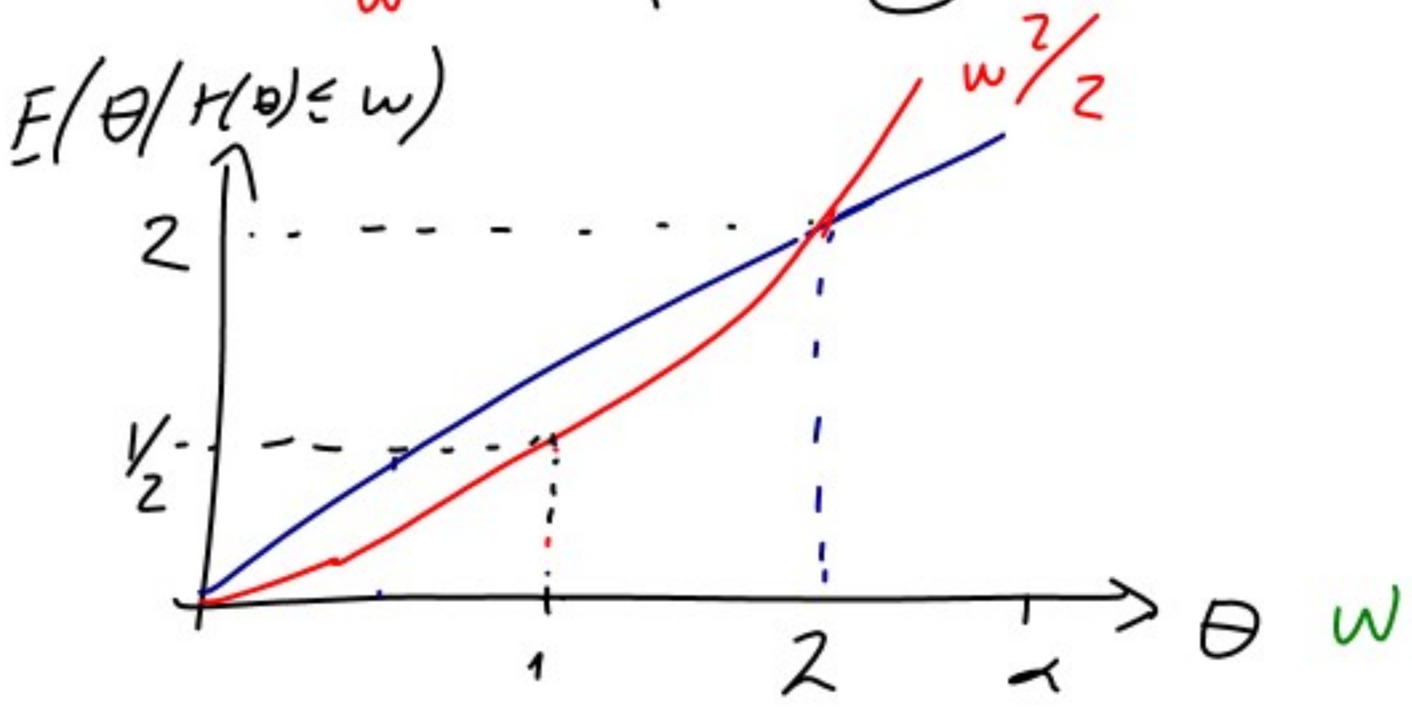






$$\frac{w^2}{2} = w \qquad w = 2$$

$$r(\theta) = \theta^{1/2}$$

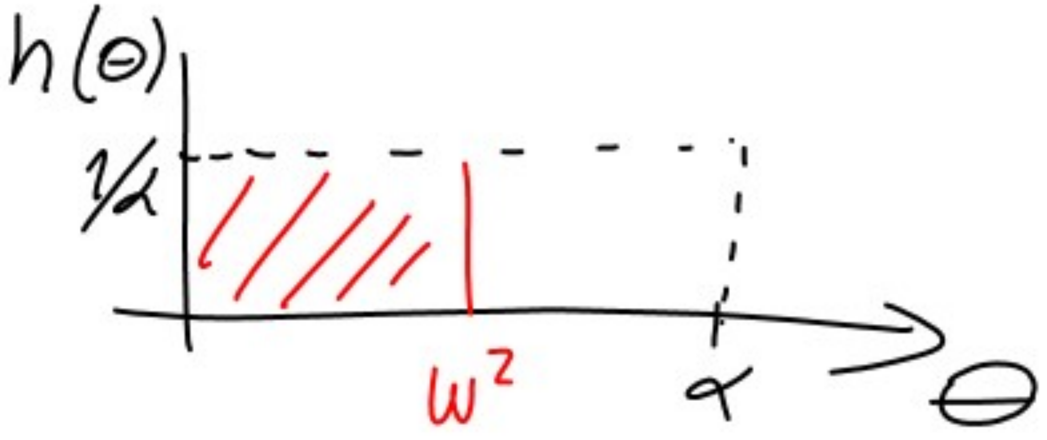
$$E(\theta \mid r(\theta) \le w)$$

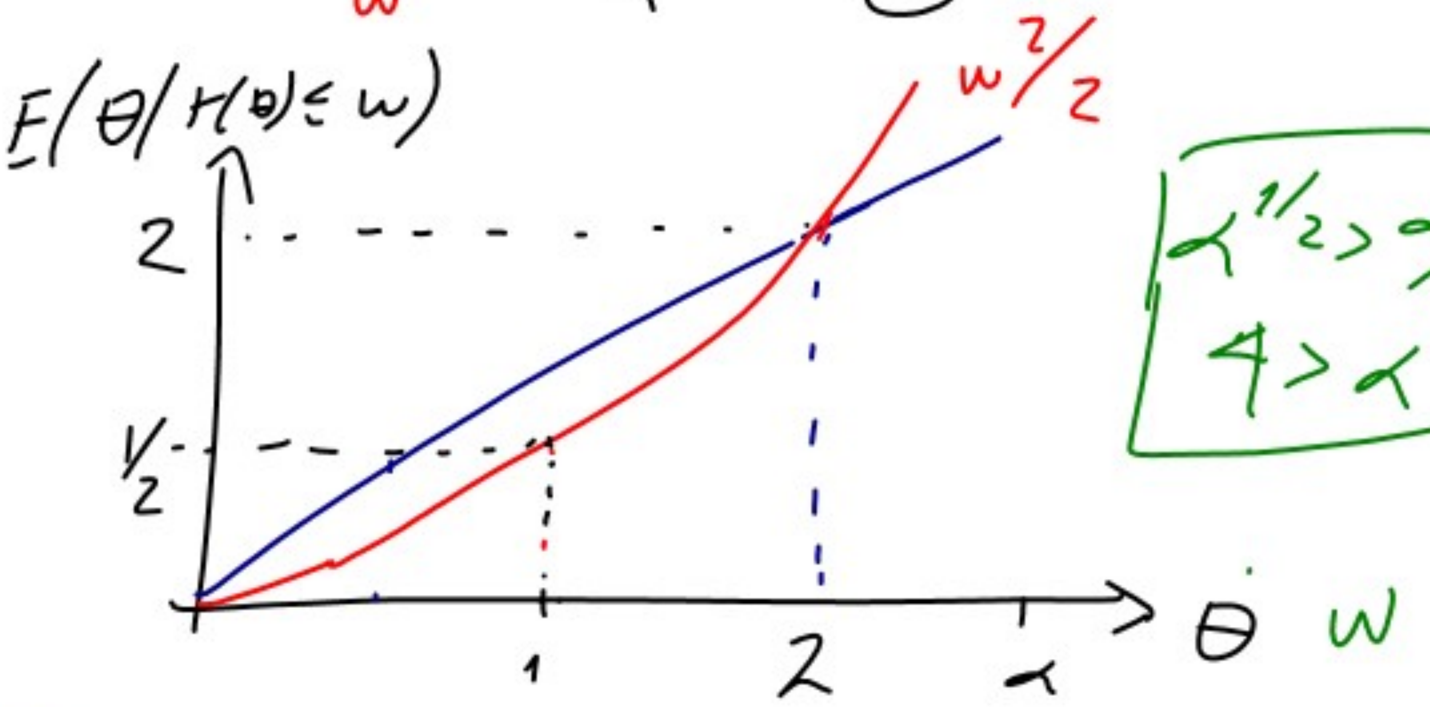
$$= E(\theta \mid \theta^{1/2} \le w) \qquad \theta \le r^{-1}(w)$$

$$= E(\theta \mid \theta \le w^2)$$

$$= \frac{\int_0^{w^2} \cancel{\tfrac{1}{\alpha}}\, \theta \, d\theta}{\int_0^{w^2} \cancel{\tfrac{1}{\alpha}}\, d\theta}$$

$$= \frac{\frac{1}{2}\theta^2 \Big|_0^{w^2}}{w^2} = \frac{1}{2} w^2$$

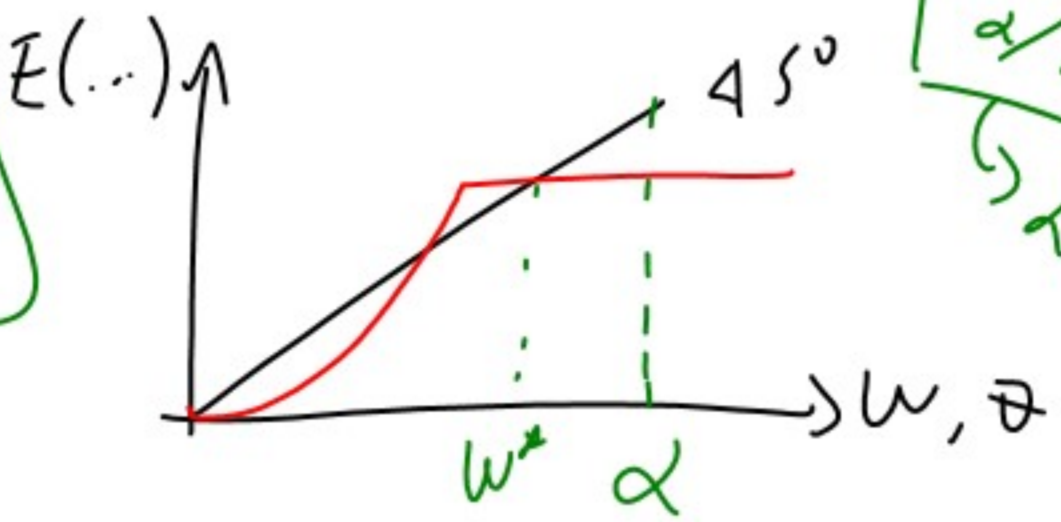


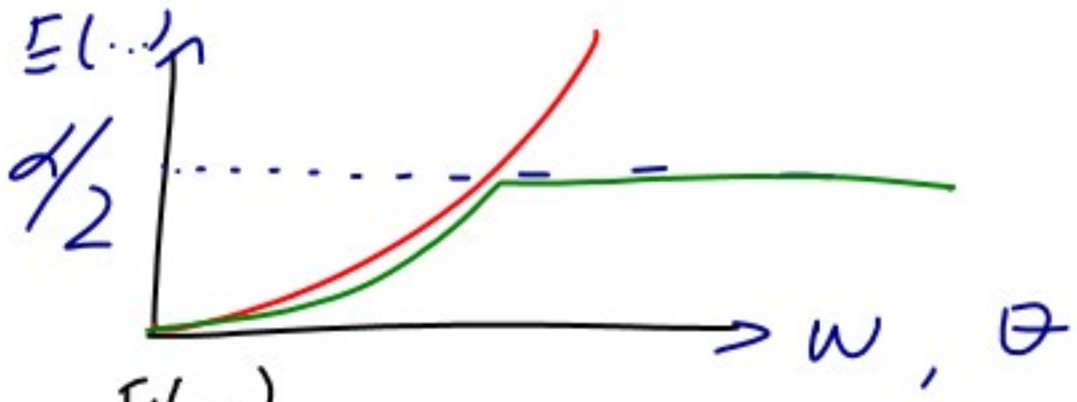


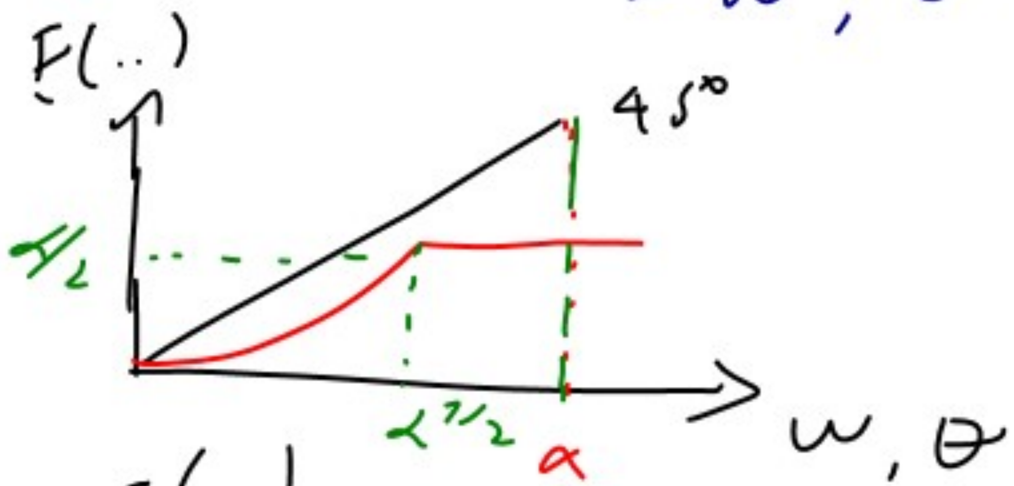
$\alpha^{1/2} > \alpha/2$

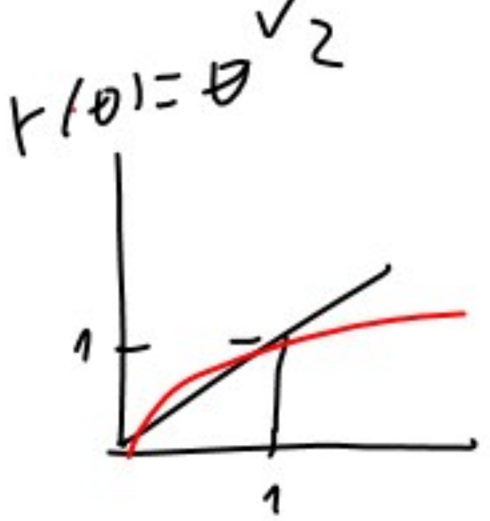
$4 > \alpha$

$4 < \alpha$ | $\alpha^{1/2} < \alpha/2$



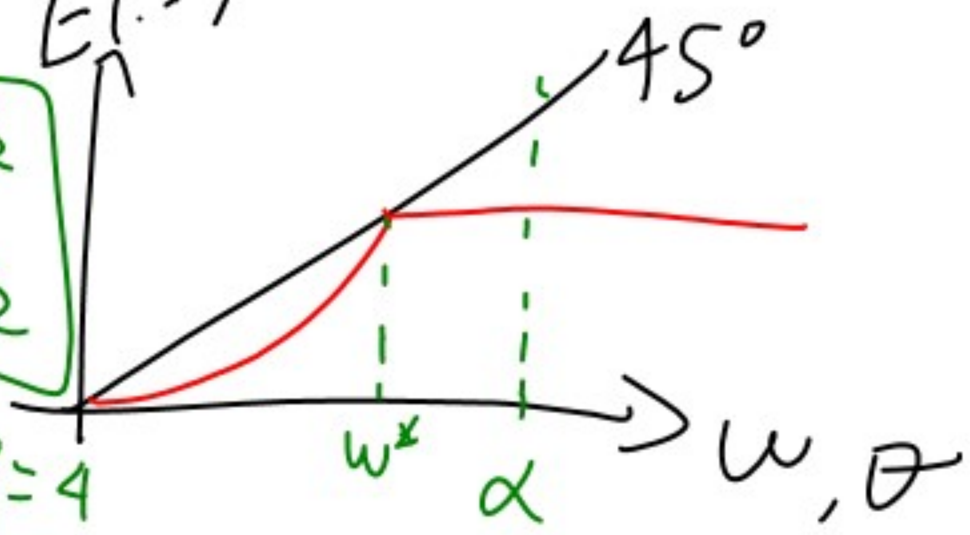






$\alpha^{1/2} = \alpha/2$

$\alpha = 4$

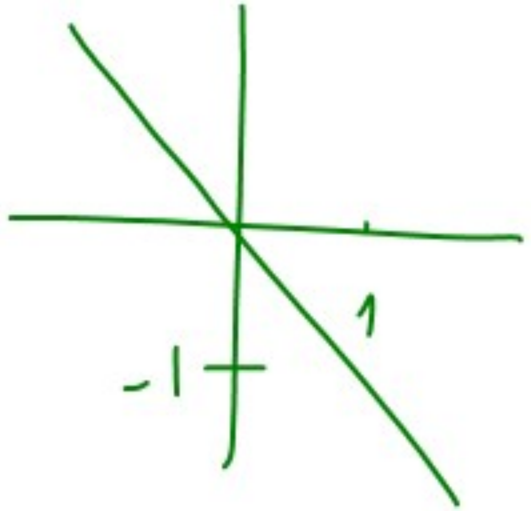


$\frac{w^2}{2} = \frac{\alpha}{2}$

$\hat{w} = \alpha^{1/2}$

$E(\theta \mid r(\theta) \leq \alpha^{1/2}) = \alpha/2$

$$\lambda_1 = \lambda_2 = \lambda$$



$$A = \begin{pmatrix} Q_1 & Q_2 \end{pmatrix} \begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix} \begin{pmatrix} Q_1 & Q_2 \end{pmatrix}^{-1}$$

$$A \begin{pmatrix} Q_1 & Q_2 \end{pmatrix} = \begin{pmatrix} Q_1 & Q_2 \end{pmatrix} \begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix}$$

$$\begin{pmatrix} AQ_1 & AQ_2 \end{pmatrix} = \begin{pmatrix} \lambda Q_1 & Q_1 + \lambda Q_2 \end{pmatrix}$$

$$(A - \lambda I) Q_2 = Q_1$$

$$AQ = \lambda Q_1$$

$$AQ_2 = Q_2 + \lambda Q_2$$

$$(A - \lambda I) Q_1 = 0$$

$$(A - \lambda I)^2 Q_2 = 0$$

$$\begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix}$$

$\tau = 1 + 1$

$\tau = 2$

$\Delta = (1)(1) - (2)(-2)$

$\Delta = 5$

$\lambda_{1-2} = \frac{\tau}{2} \pm \frac{\sqrt{\tau^2 - 4\Delta}}{2}$

$\lambda_{1-2} = \frac{2}{2} \pm \frac{\sqrt{4-20}}{2}$

$\lambda_{1-2} = 1 \pm 2i$

$\lambda_1 = 1+2i$

$\lambda_2 = 1-2i$

$$\left[\begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\right] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$$\begin{bmatrix} 1-\lambda & -2 \\ 2 & 1-\lambda \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$\lambda_1 = 1+2i$

$$\begin{bmatrix} \cancel{1-1}-2i & -2 \\ 2 & \cancel{1-1}-2i \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$$\begin{bmatrix} -2i & -2 \\ 2 & -2i \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$\lambda_2 = 1-2i$

$-\cancel{2}x_1 i - \cancel{2}x_2 = 0$

$x_1 i + x_2 = 0$

$x_1 = 1$

$x_2 = -i$

$$\boxed{v_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix} + i \begin{pmatrix} 0 \\ -1 \end{pmatrix}}$$

$$\boxed{v_2 = \begin{pmatrix} 1 \\ 0 \end{pmatrix} + i \begin{pmatrix} 0 \\ 1 \end{pmatrix}}$$

$\lambda_1 = 1+2i \qquad \lambda_2 = 1-2i$

$V_1 = \begin{pmatrix}1\\0\end{pmatrix} + i\begin{pmatrix}0\\-1\end{pmatrix} \qquad V_2 = \begin{pmatrix}1\\0\end{pmatrix} + i\begin{pmatrix}0\\1\end{pmatrix}$

$$\begin{pmatrix}x_1\\x_2\end{pmatrix} = \alpha_1\left[\begin{pmatrix}1\\0\end{pmatrix} + i\begin{pmatrix}0\\-1\end{pmatrix}\right]e^{(1+2i)t} + \alpha_2\left[\begin{pmatrix}1\\0\end{pmatrix} + i\begin{pmatrix}0\\1\end{pmatrix}\right]e^{(1-2i)t}$$

$$= e^t\left\{\alpha_1\left[\begin{pmatrix}1\\0\end{pmatrix} + i\begin{pmatrix}0\\-1\end{pmatrix}\right]\left[\cos(2t) + i\,\mathrm{SEN}(2t)\right] + \alpha_2\left[\begin{pmatrix}1\\0\end{pmatrix} + i\begin{pmatrix}0\\1\end{pmatrix}\right]\left[\cos(2t) - i\,\mathrm{SEN}(2t)\right]\right\}$$

$$= e^t\left\{\left[(\alpha_1+\alpha_2)\begin{pmatrix}1\\0\end{pmatrix}\cos(2t) - (\alpha_1+\alpha_2)\begin{pmatrix}0\\-1\end{pmatrix}\mathrm{SEN}(2t)\right] + i\left[\begin{pmatrix}0\\-1\end{pmatrix}\cos(2t)(\alpha_1-\alpha_2) + \begin{pmatrix}1\\0\end{pmatrix}\mathrm{SEN}(2t)(\alpha_1-\alpha_2)\right]\right\}$$

$$= e^t\left\{\overset{\hat{a}}{(\alpha_1+\alpha_2)}\left[\begin{pmatrix}1\\0\end{pmatrix}\cos(2t) - \begin{pmatrix}0\\-1\end{pmatrix}\mathrm{SEN}(2t)\right] + \overset{\hat{b}}{i(\alpha_1-\alpha_2)}\left[\begin{pmatrix}0\\-1\end{pmatrix}\cos(2t) + \begin{pmatrix}1\\0\end{pmatrix}\mathrm{SEN}(2t)\right]\right\}$$

$$= e^t\left\{\hat{a}\left[\begin{pmatrix}1\\0\end{pmatrix}\cos(2t) + \begin{pmatrix}0\\+1\end{pmatrix}\mathrm{SEN}(2t)\right] + \hat{b}\left[\begin{pmatrix}0\\-1\end{pmatrix}\cos(2t) + \begin{pmatrix}1\\0\end{pmatrix}\mathrm{SEN}(2t)\right]\right\}$$

$$\begin{pmatrix}x_0\\y_0\end{pmatrix} = \begin{pmatrix}1\\1\end{pmatrix}$$

$$\begin{pmatrix}x_0\\y_0\end{pmatrix} = \begin{pmatrix}1\\1\end{pmatrix} = e^0\left\{\hat{a}\left[\begin{pmatrix}1\\0\end{pmatrix}\cancelto{1}{\cos(0)} - \begin{pmatrix}0\\-1\end{pmatrix}\cancelto{0}{\mathrm{SEN}(0)}\right] + \hat{b}\left[\begin{pmatrix}0\\-1\end{pmatrix}\cancelto{1}{\cos(0)} + \begin{pmatrix}1\\0\end{pmatrix}\cancelto{0}{\mathrm{SEN}(0)}\right]\right\}$$

$$\begin{pmatrix}1\\1\end{pmatrix} = \hat{a}\begin{pmatrix}1\\0\end{pmatrix} + \hat{b}\begin{pmatrix}0\\-1\end{pmatrix} = \begin{pmatrix}1 & 0\\0 & -1\end{pmatrix}\begin{pmatrix}\hat{a}\\\hat{b}\end{pmatrix} \Rightarrow \begin{pmatrix}\hat{a}\\\hat{b}\end{pmatrix} = \begin{pmatrix}1 & 0\\0 & -1\end{pmatrix}^{-1}\begin{pmatrix}1\\1\end{pmatrix}$$

$$\begin{pmatrix}\hat{a}\\\hat{b}\end{pmatrix} = \begin{pmatrix}+1 & 0\\0 & -1\end{pmatrix}\begin{pmatrix}1\\1\end{pmatrix}$$

$$= \begin{pmatrix}1\\-1\end{pmatrix}$$