①

$$w(3) = w(0)(1+3i) \quad , \quad w(0) = 500€ \; , \; i = 0.08$$

$$w(6) = w(3)(1+3i') \quad , \quad i' = 0.01$$

$$w(6) = w(0)(1+3i)(1+3i') =$$

$$= 500€ \, (1+3\cdot 0.08)(1+3\cdot 0.01) = 638.60\,€$$

$$w(t) = w(0)(1+i)^t$$

$$(1+i_m)^m = (1+i_n)^n$$

$$i_m = (1+i_n)^{\frac{n}{m}} - 1$$

$$i = (1+i_{12})^{12} - 1 = (1+0.005)^{12} - 1 \cong 0.0617$$

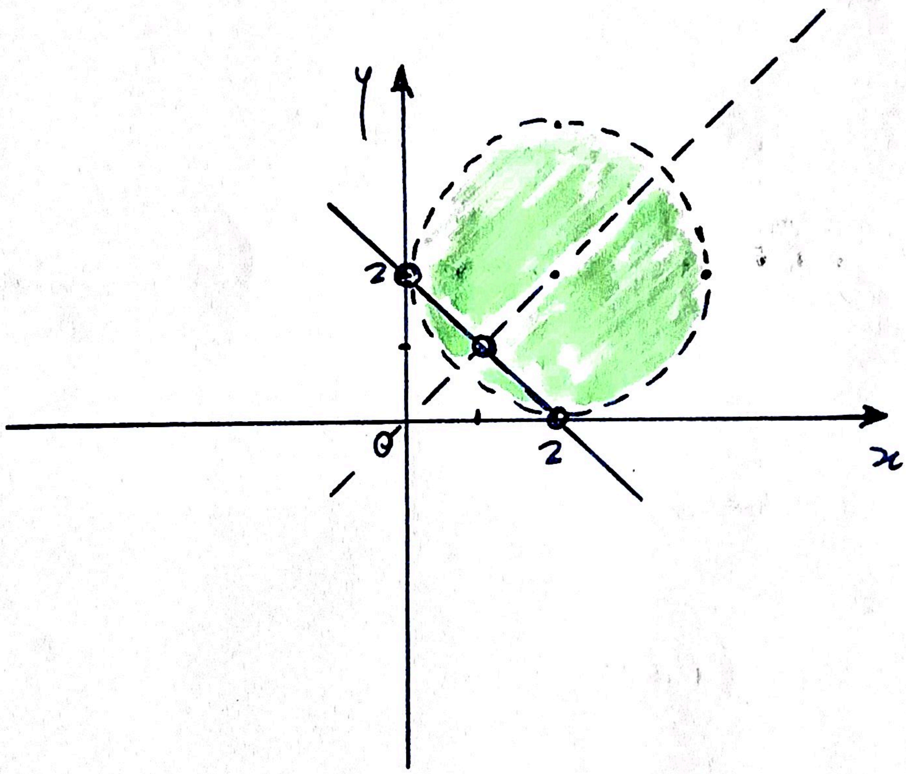
$$w(2) = w(1.5)(1+i)^{0.5} \; ; \; w(1.5) = w(2)(1+i)^{-0.5} \cong 970.52\,€$$

$$w(6) = w(2)(1+i)^4 \cong 1000€\,(1+0.0617)^4 \cong 1270.60\,€$$

③

$$f(x,y) = \frac{\sqrt{2-x-y}}{y-x} + \ln\left[4-(x-2)^2-(y-2)^2\right]$$

$$\begin{cases} 2-x-y \geq 0 \\ y-x \neq 0 \\ 4-(x-2)^2-(y-2)^2 > 0 \end{cases} \qquad \begin{cases} x+y \leq 2 \\ y \neq x \\ (x-2)^2+(y-2)^2 < 4 \end{cases}$$



4)

$f(x,y) = e^{2x-3y}$ $\qquad$ $\underline{x}_0 = (1,0)$

$f(\underline{x}_0) = f(1,0) = e^2$

$f'_x(x,y) = 2e^{2x-3y}$

$f'_y(x,y) = -3e^{2x-3y}$

$$\nabla f(x,y) = \begin{bmatrix} 2e^{2x-3y} \\ -3e^{2x-3y} \end{bmatrix} \qquad \nabla f(\underline{x}_0) = \nabla f(1,0) = \begin{bmatrix} 2e^2 \\ -3e^2 \end{bmatrix}$$

$f''_{xx}(x,y) = 4e^{2x-3y}$

$f''_{xy}(x,y) = f''_{yx}(x,y) = -6e^{2x-3y}$

$f''_{yy}(x,y) = 9e^{2x-3y}$

$$\underline{\underline{H}}_f(x,y) = \begin{bmatrix} 4e^{2x-3y} & -6e^{2x-3y} \\ -6e^{2x-3y} & 9e^{2x-3y} \end{bmatrix}$$

$$\underline{\underline{H}}_f(\underline{x}_0) = \underline{\underline{H}}_f(1,0) = \begin{bmatrix} 4e^2 & -6e^2 \\ -6e^2 & 9e^2 \end{bmatrix}$$

$$T_2(x,y) = f(\underline{x}_0) + \nabla f^T(\underline{x}_0)(\underline{x}-\underline{x}_0) +$$

$$+ \frac{1}{2}(\underline{x}-\underline{x}_0)^T \underline{\underline{H}}f(\underline{x}_0)(\underline{x}-\underline{x}_0) =$$

$$= e^2 + \begin{bmatrix} 2e^2 & -3e^2 \end{bmatrix} \begin{bmatrix} x-1 \\ y \end{bmatrix} +$$

$$+ \frac{1}{2}\begin{bmatrix} x-1 & y \end{bmatrix} \begin{bmatrix} 4e^2 & -6e^2 \\ -6e^2 & 9e^2 \end{bmatrix} \begin{bmatrix} x-1 \\ y \end{bmatrix} =$$

$$= e^2 \left\{ 1 + \begin{bmatrix} 2 & -3 \end{bmatrix} \begin{bmatrix} x-1 \\ y \end{bmatrix} + \frac{1}{2}\begin{bmatrix} x-1 & y \end{bmatrix} \begin{bmatrix} 4 & -6 \\ -6 & 9 \end{bmatrix} \begin{bmatrix} x-1 \\ y \end{bmatrix} \right\} =$$

$$= e^2 \left\{ 1 + 2(x-1) - 3y + \frac{1}{2}\begin{bmatrix} x-1 & y \end{bmatrix} \begin{bmatrix} 4(x-1) - 6y \\ -6(x-1) + 9y \end{bmatrix} \right\} =$$

$$= e^2 \Big\{ 1 + 2(x-1) - 3y + \frac{1}{2}\Big[4(x-1)^2 - 6(x-1)y$$

$$- 6(x-1)y + 9y^2 \Big] \Big\} =$$

$$= e^2 \left[1 + 2(x-1) - 3y + 2(x-1)^2 - 6(x-1)y + \frac{9}{2}y^2 \right]$$

(5)

$$\det(\underline{\underline{C}} - \lambda \underline{\underline{I}}) = 0$$

$$\begin{vmatrix} 1-\lambda & 0 & 0 \\ 0 & -2-\lambda & 1 \\ 1 & 2 & 1-\lambda \end{vmatrix} = 0$$

$$(1-\lambda)\left[(-2-\lambda)(1-\lambda) - 2\right] = 0$$

$$(1-\lambda)(-2+2\lambda-\lambda+\lambda^2-2) = 0$$

$$(1-\lambda)(\lambda^2+\lambda-4) = 0$$

$$\lambda = 1 \quad \vee \quad \lambda = \frac{-1 \pm \sqrt{17}}{2}$$

$$(\underline{\underline{C}} - \lambda \underline{\underline{I}})\,\underline{v} = \underline{0}$$

$$(\underline{\underline{C}} - \underline{\underline{I}})\,\underline{v} = \underline{0}$$

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & -3 & 1 \\ 1 & 2 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & -3 & 1 \\ 1 & 2 & 0 \end{bmatrix} \sim \begin{bmatrix} 1 & 2 & 0 \\ 0 & -3 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{cases} x + 2y = 0 \\ -3y + z = 0 \end{cases} \qquad \begin{cases} x = -2y \\ z = 3y \end{cases}$$

If, for example, we choose $y = 1$, we have:

$$\begin{cases} x = -2 \\ y = 1 \\ z = 3 \end{cases}$$

$$\underline{v} = \begin{bmatrix} -2 \\ 1 \\ 3 \end{bmatrix}$$