① (a) ✓ $\boxed{4п}$

(б)
$$\begin{cases} x' = x^3 + xy^2 + x^2 + y^2 \\ y' = -yx^2 - y^3 \end{cases}$$

$$dF(X) = \begin{bmatrix} 3x^2 + y^2 + 2x & 2xy + 2y \\ -2xy & -x^2 - 3y^2 \end{bmatrix} \Rightarrow A = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \quad \boxed{5п}$$

неас. стаб.

?

$$\alpha' = (\alpha+1)\alpha^2 = \alpha^3 + \alpha^2$$

$$\frac{\alpha'}{\alpha^2(1+\alpha)} = 1 \qquad \boxed{8п}$$ нестаб.

(в) $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ → седло → нест. $\boxed{3п}$

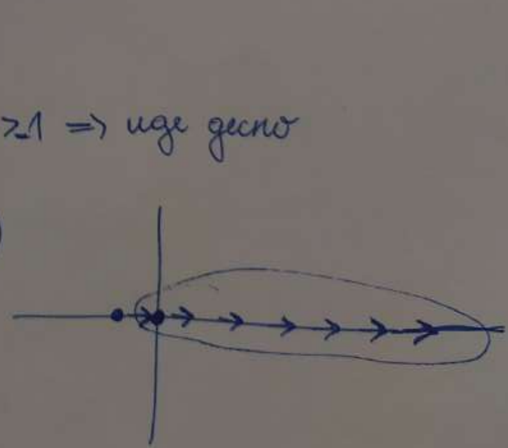
✓

нест и орбитални $\boxed{3п}$

$x \geq 1 \Rightarrow$ иде десно

$y = 0: \quad x' = x^3 + x^2 = x^2(1+x)$

$y' = 0$



2 $y_{p_1}(x) = \begin{bmatrix} \sin x + e^x \\ (x+1)e^{2x} \end{bmatrix}$, $y_{p_1}'(x) = \begin{bmatrix} \cos x + e^x \\ e^{2x} + e^{2x}\cdot 2(x+1) \end{bmatrix}$

$$\left.\begin{aligned} \cos x + e^x &= a(\sin x + e^x) + b(x+1)e^{2x} + g_1(x) \\ e^{2x}(2x+3) &= c(\sin x + e^x) + d(x+1)e^{2x} + g_2(x) \end{aligned}\right\}$$

$y_{p_2}(x) = \begin{bmatrix} \sin x - e^x \\ xe^{2x} \end{bmatrix}$, $y_{p_2}'(x) = \begin{bmatrix} \cos x - e^x \\ e^{2x}(2x+1) \end{bmatrix}$

$$\left.\begin{aligned} \cos x - e^x &= a(\sin x - e^x) + b\,xe^{2x} + g_1(x) \\ e^{2x}(2x+1) &= c(\sin x - e^x) + dxe^{2x} + g_2(x) \end{aligned}\right\} \quad \boxed{2}$$

---

(1)−(3): $2e^x = a(2e^x) + be^{2x}$

(2)−(4): $2e^{2x} = c(2e^x) + de^{2x}$ $\boxed{6}$

$e^x(2-2a) = be^{2x} \Rightarrow a=1,\ b=0$ $\boxed{4}$

$e^{2x}(2-d) = 2ce^x \Rightarrow c=0,\ d=2$

$A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$

$g_1(x) = \cos x - \sin x$ $\boxed{4}$

$g_2(x) = e^{2x}$

ДЈБ решења септембар 2 - 2023

③ $$\frac{dz}{dx} = \frac{6x^3y(z+2z^n)}{2(1-n)xy} = \frac{3x^2(z+2z^n)}{1-n}$$

$$z^{1-n} = y \Rightarrow (1-n)z^{-n}z' = y'$$

$$\frac{y'}{\cancel{1-n}} \cdot \cancel{z^n} = \frac{3x^2}{\cancel{1-n}} \cancel{z^n}(2+y)$$

$$y' = 3x^2(2+y)$$

$$\ln|2+y| = x^3 + \tilde{c}$$

$$\boxed{y = ce^{x^3} - 2}$$

$\boxed{8п}$

$$\psi_1 = \frac{y+2}{e^{x^3}}$$

$$\frac{a x^3 y\, dy + b x^2 y^2 dx}{a x^3 y(3(n-1)y^2 - 2z - 4z^n) + b x^2 y^2 \cdot 2(1-n)xy} = \frac{dz}{6x^3y(z+2z^n)}$$

$$a\cancel{x^3}\cancel{y^3} \cdot 3\cancel{(n-1)} = b\cancel{x^2}\cancel{y^2} \cdot 2\cancel{(n-1)}\cancel{xy}$$

$$\frac{a}{b} = \frac{2}{3}$$

$$\frac{2x^3y\, dy + 3x^2y^2 dx}{-\cancel{4}_{2}\cancel{x^3y}\cancel{(z+2z^n)}} = \frac{dz}{_{3}\cancel{6}\cancel{x^3y}\cancel{(z+2z^n)}}$$

$$d(x^3y^2) = -\frac{2}{3}dz \; / \int$$

$\boxed{8п}$

$$x^3y^2 = -\frac{2}{3}z + c \qquad \psi_2 = x^3y^2 + \frac{2}{3}z$$

$$\begin{vmatrix} \frac{\partial\psi_1}{\partial z} & \frac{\partial\psi_1}{\partial y} \\ \frac{\partial\psi_2}{\partial z} & \frac{\partial\psi_2}{\partial y} \end{vmatrix} = \begin{vmatrix} 0 & e^{-x^3} \\ \frac{2}{3} & 2x^3y \end{vmatrix} = -\frac{2}{3}e^{-x^3} \neq 0 \quad +0P$$

$\boxed{2п}$