Sem 1.

1) $tx' - x = t^2 e^t$ (ec. afină)

3) $x' + \frac{2}{t} x = t^3$ — " —

4) $x' = x^2 e^t - 2x$ (ec Bernoulli)

5) $tx' = 2t^2\sqrt{x} + 4x$ (— " —)

2) $x' = \frac{2x + \ln t}{t \ln t}$, $t > 1$ (ec. afină)

Sem 2

1) $tx' - (2t+1)x + x^2 + t^2$, $\varphi_0 = at + b$ (Riccati)

2) $x' = x^2 - 2xe^t + e^{2t} + e^t$, $\varphi_0 = e^t$ (— " —)

3) $2t^2 x' = t + x^2$, $t > 0$ (omogenă)

4) $x' = \frac{x + \sqrt{tx}}{t}$, $t > 0$ (— " —)

5) $tx' = x + t\cos^2\frac{x}{t}$, $t > 0$ (— " —)

Sem 3.

1) $x'(t) = \frac{2t(x^2+5x+6)}{t^2+4}$ (variabile sep.)

2) $\frac{dx}{dt} = \frac{2tx\ln x}{(t^2+1)\ln(\ln x)}$, $x > 1$ (— " —)

3) $\frac{dx}{dt} = x\,tg\,t + \cos t$, $t \in (0, \frac{\pi}{2})$, $x \in \mathbb{R}$ (afină)

4) $x' + x^2 - 2x\sin t + \sin^2 t - \cos t = 0$, $\varphi_0 = \sin t$ (Riccati)

Sem 4.

1) $\frac{dx}{dt} = \frac{2t - x + 1}{4t - 2x + 3}$, $4t - 2x + 3 > 0$ (reductibile la omogenă)

2) $\frac{dx}{dt} = \frac{3t + x - 5}{2t - x}$, $2t - x > 0$

a) $tx''(t) + x'(t) + t = 0$ (se not. $y = x'$, $\boxed{B}$ 1.)

b) $t^2 x'' - tx' - 3x = 0$ (Euler)

Sem 5.

1) $x^2 + (x')^2 - 2xx'' = 0$ (autonomă)

2) $txx'' + t\cdot(x')^2 - xx' = 0$, $t > 0$ (omogenă)

3) $x = t(x')^2 + (x')^3$ (Lagrange)

4) $x = 2tx' - (x')^2$ (— " —)

Sem 6 1) $x'' + 4x' + 5x = 0$ (ec. liniară de ord $\underline{II}$ cu coef constanți omogenă)

2) $x'' = \sqrt{1+(x')^2}$ (ec. tip B 1.)

sch. de funcție $y(t) = x'(t) \Rightarrow y' = \sqrt{1+y^2}$ evs

3) $t^2x'' - 2txx' + tx' = 0 \rightarrow$ ec. Euler

4) $x''\cos x + (x')^2 \sin x - x' = 0$, $x \in (0, \frac{\pi}{2})$ autonomă (fără t)

Sem 7 1) $\begin{cases} \frac{dx}{dt} = \sin x \cdot t, \\ x(0) = \frac{\pi}{4} \end{cases}$ $(t,x) \in [-1,1] \times [0, \frac{\pi}{2}]$ (probl Cauchy)

2) $\begin{cases} \frac{dx}{dt} = 2x + t \\ x(0) = 1 \end{cases}$ $(t,x) \in \mathbb{R}^2$

3) $\begin{cases} \frac{dx}{dt} = tx \\ x(0) = 1 \end{cases}$

Sem 8 1) $\begin{cases} x_1' = \frac{x_1(t^2+x_2^2)}{t(x_2^2-x_1^2)} \\ x_2' = -\frac{x_2(t^2+x_1^2)}{t(x_2^2-x_1^2)} \end{cases}$

2) $\begin{cases} x' = \frac{x^2-t}{y} \\ y' = -x \end{cases}$ $F(t,(x,y)) = t^2 + 2xy$ int. primă

3) $F = x^2 - y^2$ $\begin{cases} x' = yz \\ y' = xz \\ z' = xy \end{cases}$

4) $\begin{cases} x_1' = 3x_1 + 2x_2 \\ x_2' = 2x_1 + 3x_2 \end{cases}$

Sem 9 1) $\begin{cases} x_1' = x_1 + x_2 \\ x_2' = 3x_2 - 2x_1 \end{cases}$

2) $\begin{cases} x_1' = 2x_1 - x_2 - x_3 \\ x_2' = 3x_1 - 2x_2 - 3x_3 \\ x_3' = -x_1 + x_2 + 2x_3 \end{cases}$

3) $\begin{cases} x_1' = 2x_1 - x_2 - x_3 + e^t \\ x_2' = 3x_1 - 2x_2 - 3x_3 + 1 \\ x_3' = -x_1 + x_2 + 2x_3 - e^{2t} \end{cases}$

Sem 10 1) $\begin{cases} x_1' = \frac{1}{t}x_1 + \frac{2}{t}x_2 & t>0 \\ x_2' = -\frac{2}{t}x_1 - \frac{3}{t}x_2 + \ln t \end{cases}$

2) $\begin{cases} x_1' = -\frac{1}{t}(x_1 + 2x_2) + t\cos t & , t\in\left(0, \frac{\pi}{2}\right) \\ x_2' = \frac{1}{t}(3x_1 + 4x_2) \end{cases}$

3) $\begin{cases} x_1' = \frac{1}{2}\left(1 + \frac{1}{t} - \frac{1}{t^2}\right)x_1 + \frac{1}{2}\left(1 + \frac{1}{t} + \frac{1}{t^2}\right)x_2 \\ x_2' = -\frac{1}{2}\left(1 - \frac{1}{t} + \frac{1}{t^2}\right)x_1 + \frac{1}{2}\left(1 - \frac{1}{t} - \frac{1}{t^2}\right)x_2 \end{cases}$ $\varphi_1 = \begin{pmatrix} t+1 \\ 1-t \end{pmatrix}$ $t>0$

4) $x^{(3)} - x = 0$; 5) $x^{(3)} - x = e^t$; 6) $x'' + 8x' + 16x = t^2$,

7) $x'' - 4x' + 8x = e^{2t}\sin t$; 8) $x''' + x = \frac{2}{t^3} + \ln t$, $t>0$

Sem 11 1) $x'' - 2x' + x = 2te^t$; 2) $x^{(5)} + 8x^{(3)} + 16x^{(1)} = 32$

3) $t^3 x^{(3)} + t x^{(1)} - x = t^2$; $t>0$;

4) $(2t+3)^3 x^{(3)} + 4(2t+3)^2 x^{(2)} + 4(2t+3)x^{(1)} - 8x = 8(2t+3)$ $t > -\frac{3}{2}$

5) $t^2 x^{(3)} - 2x' = 9t^2$, $t>0$ $\begin{cases} x(-1) = 1 \\ x'(-1) = 2 \\ x''(-1) = 0 \end{cases}$

6) $t^3 x^{(2)} - 2tx = 3\ln t$, $t>0$

Sem 12 1 a) $x_1^2 \partial_1 u + x_2^2 \partial_2 u = 2(x_1 + x_2)$

b) $x_2 \partial_1 u + x_1 \partial_2 u = 2u$

c) $x_1 \partial_1 u + x_2 \partial_2 u = (x_1 + x_2)\cdot u$

d) $x_1 \partial_1 u + x_2 \partial_2 u = x_1 x_2 (u^2 + 1)$

2) a) $x_2 \partial_1 u + (2x_1 - x_2)\partial_2 u = 4x_1(x_1 + x_2)$

$u(x_1, x_2) = -\frac{1}{2}x_1 x_2$ pe $S: \begin{cases} h(x_1, x_2) = x_1 + 2x_2 = 0 \\ x_1 > 0 \end{cases}$

b) $\begin{cases} x_2 \partial_1 u + x_1 \partial_2 u = 2u \\ u(x_1, x_2) = \frac{x_1^2}{2} \text{ pe } S = \{x \in \mathbb{R}^2 \mid x_2 = 0\} \end{cases}$

c) $\begin{cases} (x_1 + 3x_2)\,\partial_1 u + (x_1 - x_2)\,\partial_2 u = u + x_1 + x_2 \\ u(x_1, x_2) = 3x_1 \text{ pe } S = \{x \in \mathbb{R}^2 \mid 2x_1 - x_2 = 0\} \end{cases}$