**Diferencialna enačba I. reda z ločljivima spremenljivkama**:

$y' = f(x) \cdot g(y) \quad ; \quad y(a) = \alpha \quad \Rightarrow \quad \int \frac{dy}{g(y)} = \int f(x)dx$

**Homogena diferencialna enačba I. reda**:

$y' = f\left(\frac{y}{x}\right) \; ; \; y(a) = \alpha \quad \Rightarrow \quad u(x) = \frac{y}{x} \;\rightarrow\; y' = x \cdot u(x) + u(x) \; ; \; u(a) = \frac{\alpha}{a}$

**Linearna diferencialna enačba I. reda**:

$y' + f(x) \cdot y = g(x) \quad ; \quad y(a) = \alpha$

1. homogena enačba: $y' + f(x) \cdot y = 0 \quad \Rightarrow \quad \frac{y'}{y} = -f(x) \;\rightarrow\; y_H = e^{-\int f(x)dx}$
2. partikularna enačba: $y_P = C(x) \cdot y_H = \int \frac{g(x)}{y_H} dx \cdot y_H$
3. rešitev: $y = y_P + C \cdot y_H$

**Bernoulijeva enačba**:

$y' + f(x) \cdot y = g(x) \cdot y^n \quad ; \quad y(a) = \alpha$

$\frac{y'}{y^n} + f(x) \cdot \frac{y}{y^n} = g(x) \quad ; \quad \frac{y}{y^n} = y^{-n+1} = z$

$z' + f(x) \cdot (-n+1) = g(x) \cdot (-n+1) \;\Leftarrow\; \text{linearna d.e. I. reda} \rightarrow \text{izraziš } y = z^{\frac{1}{-n+1}}$

**Linearna diferencialna enačba II. reda s konstantnimi koeficienti**:

$y = y(x) \qquad ay'' + by' + cy = g(x)$

1. homogena enačba: $ay'' + by' + cy = 0$ z nastavkom $y = e^{\lambda x}$

$\lambda_1 = a \quad \lambda_2 = b \;\Rightarrow\; y_1 = e^{ax} \quad y_2 = e^{bx}$

$\lambda_{1,2} = a \;\Rightarrow\; y_1 = e^{ax} \quad y_2 = xe^{ax}$

$\lambda_{1,2} = a \pm bi \;\Rightarrow\; y_1 = e^{ax} \cdot \cos(bx) \quad y_2 = e^{ax} \cdot \sin(bx)$

Linearno neodvisne rešitve:

$\Rightarrow \; W \neq 0$

$\Rightarrow \; \frac{u(x)}{v(x)} \neq \text{konst}$

2. partikularna enačba: $y_P = -y_1(x) \int_{x_0}^{x} \frac{y_2(u) \cdot g(u)}{W(u)} du + y_2(x) \int_{x_0}^{x} \frac{y_1(u) \cdot g(u)}{W(u)} du \qquad W = y_1 \cdot y_2' - y_1' \cdot y_2$
3. rešitev: $y = y_P + C_1 \cdot y_1 + C_2 \cdot y_2$

$\Rightarrow \; W \neq 0$

$y_1 = e^x \quad y_1 = e^{-x} \quad y_1 = \sin x \quad y_1 = \cos x$

$f(x) = e^x \cdot \cos x \;\rightarrow\; e^{(1+i)x} = e^x \cdot e^{ix} = e^x \cdot (\cos x + i \sin x) = \mathrm{Re}\left(e^{(1+i)x}\right)$

$y_P = A \cdot e^{(1+i)x}$

$e^{ix} = \cos x + i \sin x$

$e^{x(a+ib)} = e^{xa}(\cos bx + i \sin bx)$

**Nastavki za d.e. II. reda:**

$y_1 = e^x \quad y_2 = e^{2x}$

$f(x) = 2x^2 + 3x + 5$

$y_P = ax^2 + bx + c$

$f(x) = \sin x$

$y_P = a \sin x + b \cos x$

$f(x) = \sin^2 x = \frac{1}{2} - \frac{1}{2}\cos 2x$

$y_{P1} = A$; če $y_1 = xe^x \rightarrow y_P = Ax$

$y_{P2} = a \sin x + b \cos x$

$f(x) = e^{3x}$

$y_P = ae^{3x}$

$f(x) = e^x$

$y_P = a \cdot x \cdot e^x$

$y_1 = \sin x \quad y_2 = \cos x$

$f(x) = \sin x$

$y_P = x(a \sin x + b \cos x)$

$$\int (x^n)dx = \frac{x^{n+1}}{n+1} + c$$

$$\int (e^{ax})dx = \frac{e^{ax}}{a} + c$$

$$\int (a^x)dx = \frac{a^x}{\log a} + c$$

$$\int \left(\frac{1}{x}\right)dx = \log x + c$$

$$\int \left(\frac{1}{x-a}\right)dx = \log(x-a) + c$$

$$\int \left(\frac{1}{(x-a)^m}\right)dx = -\frac{\ldots}{(m-\ldots}$$

$$\int \left(\frac{x}{(1+x^2)^m}\right)dx = -\frac{\ldots}{2(\ldots}$$

$$\int \left(\frac{x}{(1+x^2)}\right)dx = \frac{1}{\ldots}$$

$$\int \left(\frac{1}{\cos^2 x}\right)dx = \int (1 + t\ldots$$

$$\int \left(\frac{1}{\sqrt{1-x^2}}\right)dx = \arcsin x + c$$

$$\int \left(\frac{1}{1+x^2}\right)dx = \arctan x + c$$

$$\int \left(\frac{1}{\sqrt{a^2-x^2}}\right)dx = \arcsin\frac{x}{a} + c$$

$$\ldots) = \cosh x + c$$

$$\ldots x + c$$

$$\int \left(\frac{1}{\sqrt{1+x^2}}\right) = \operatorname{arcsinh} x + C$$

$$= \log\left(x + \sqrt{1+x^2}\right.$$

$$\int \left(\frac{1}{x^2-1}\right) = \frac{1}{2}\log\left(\frac{x-1}{x+1}\right) + c$$

$$\int \frac{f'(x)}{f(x)}dx = \log(f(x))$$

$$\ldots x\, dx = \frac{1}{2}\sin 2x$$

$$f(x)^{g(x)} = e^{g(x)\cdot \log f(x)}$$

$$e^{-\frac{y}{x}} \xrightarrow{pox} e^{-\frac{y}{\ldots}}$$

$$e^{\frac{y}{\ldots}} \xrightarrow{\ldots} e^{\frac{y}{x}}\Big($$

$$(x^\alpha)' = \alpha \cdot x\ldots$$

$$(e^{ax})' = ae^x$$

$$(a^x)' = a^x\ldots$$

$$(\log x)' = \frac{1}{x}$$

$$(\sin x)' = \cos x$$

$$\ldots \sin x$$

$$(tgx)' = \frac{1}{\cos^2 x} = 1 + tg^2 x$$

$$(ctgx)' = -\frac{1}{\sin^2 \ldots} = \ldots$$

$$\ldots\cosh x$$

$$\ldots = \sinh x$$

$$(tghx)' = \frac{1}{\cosh^2 x} = 1 + tgh^2 x$$

$$\ldots hx)' = -\frac{1}{\ldots} = -(1 + ctg\ldots$$

$$(\arcsin x)' = \frac{1}{\sqrt{1-\ldots}}$$

$$(\arccos x)' = -\frac{1}{\sqrt{1-\ldots}}$$

$$(\arctan x)' = \frac{1}{1+x^2}$$

$$(\operatorname{arcctan} x)' = -\frac{1}{1+x^2}$$

$$\ldots \frac{1}{\sqrt{1\ldots}}$$

$$(\operatorname{arccosh} x)' = -\frac{\ldots}{\sqrt{1\ldots}}$$

$$\ldots \frac{1}{1-x^2}$$

$$(\operatorname{arcctanh} x)' = -\frac{1}{1-x^2}$$

$$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$$

$$\sin^3 x = \sin^2 x \cdot \sin x = (1 - \cos^2 x)\cdot \sin x$$

$$\cos^2 x = \frac{1}{2}(1 + \cos 2x)$$

$$\sin^4 x = \left(\frac{1}{2}(1 + \cos 2x)\right)^2 = \frac{1}{4}(1 - 2\cos 2x + \cos^2 2x)$$

$$\cos^4 x = \frac{1}{4}(1 + 2\cos 2x + \cos^2 2x)$$

$$\cosh^2 x - \sinh^2 x = 1$$

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

$$\cosh x = \frac{e^x + e^{-x}}{2}$$

$$(x^3 + 1) = (x+1)(x^2 - x + 1)$$

$$x^3 + 3x^2 + 3x + 1 = (x+1)^3$$

$$\int_0^{2\pi} \sin^2 x \cdot dx = \int_0^{2\pi} \cos^2 x \cdot dx = \ldots$$

$$\int \frac{1}{x^2 + y^2}\, dy = \frac{1}{x}\arctan\left(\frac{y}{x}\right)$$

$$\int \frac{1}{(c+z)^3}\, dz = \frac{1}{-2(c\ldots}$$

$$\int \frac{1}{\sqrt{1+x^2}}\, dx = x + \sqrt{1+\ldots}$$

$$\int (\sin x) dx = -\cos\ldots$$

$$\int (\cos x) dx = \sin x\ldots$$

$$\sin' x = \cos x$$

$$\cos' x = -\sin x$$

$$\sin 2x = 2 \cdot \sin x \cdot \cos x$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$\sin^2(\arccos x) = 1 - \cos^2(\arccos x) = 1 - x^2$$

$$\cos(\arccos x) = x$$

$$\cos^2(\arccos x) = [\cos(\arccos x)]^2 = x^2$$