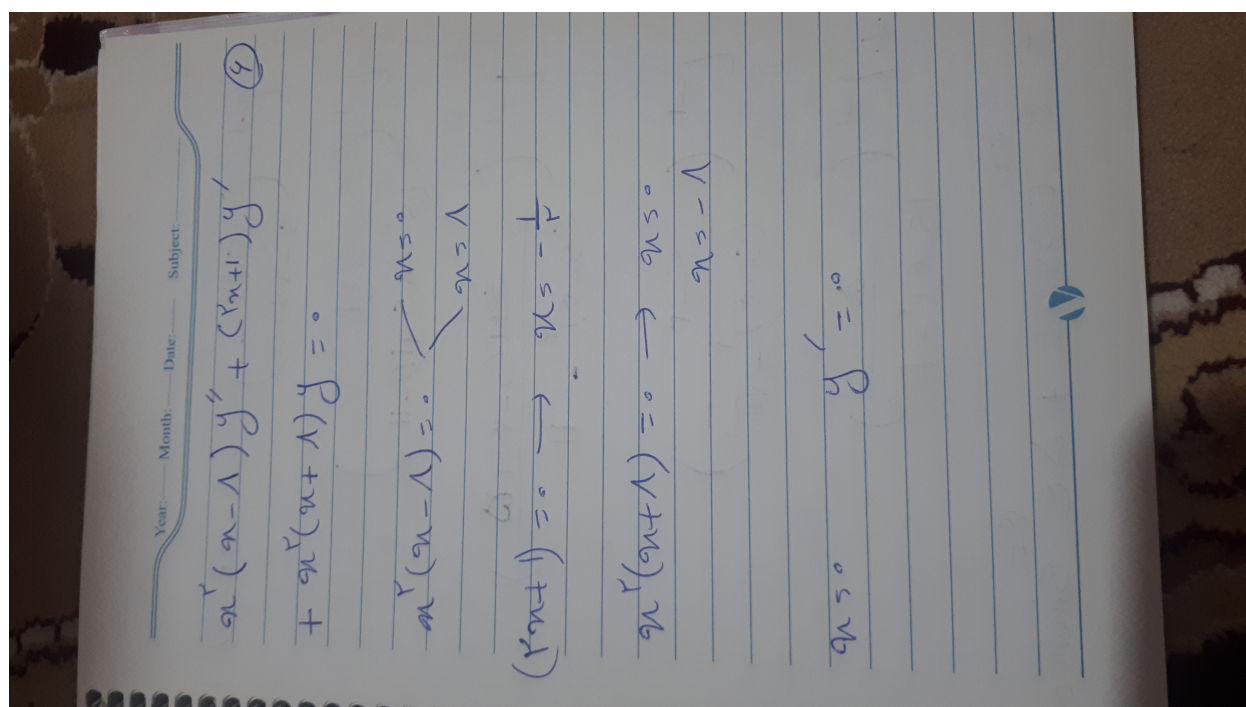
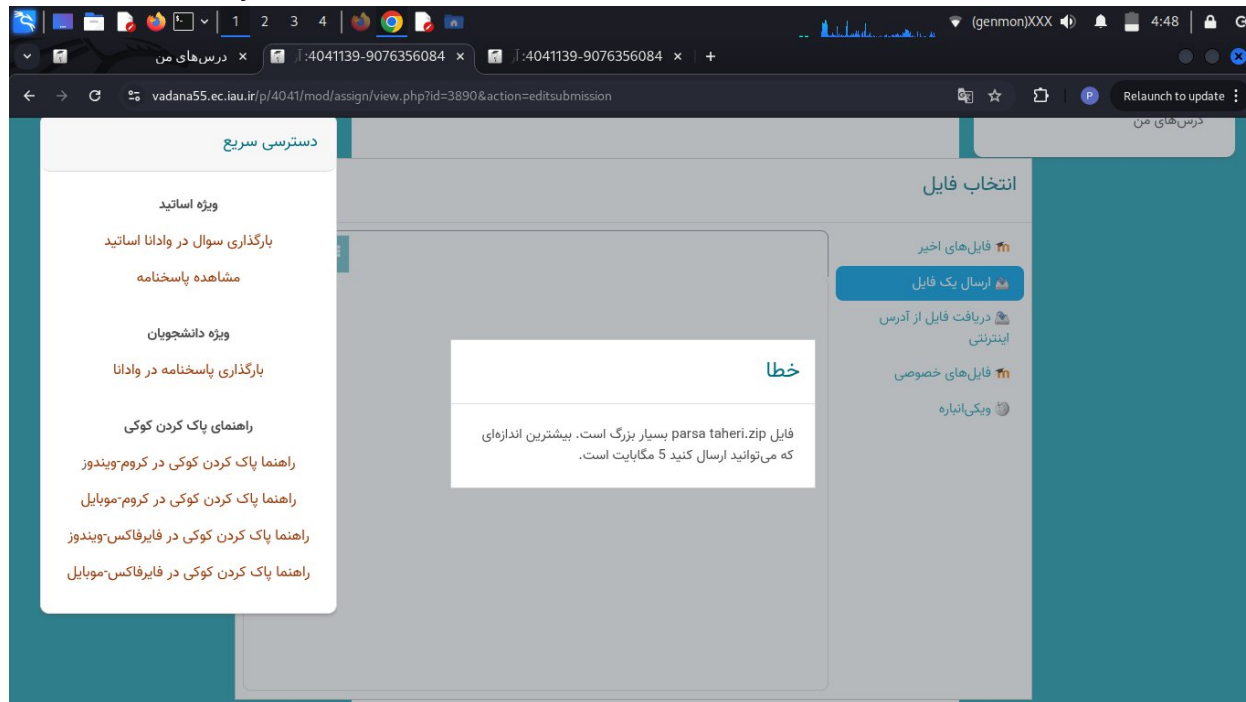


Salam ostad
koli tool keshid hajmo kam konam



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$$\mathcal{L}^{-1} \left(\frac{s+1}{s^2 - \lambda s + 9} \right) \quad (\text{ب. ٤})$$

$$\mathcal{L}^{-1} \left(\frac{s+1}{(s^2 - \lambda s + 9) - 11} \right)$$

$$\mathcal{L}^{-1} \left(\frac{(s-\lambda)(s-\lambda) + 11}{(s-\lambda)^2 - 11} \right)$$

$$\mathcal{L}^{-1} \left(\frac{s-\lambda}{(s-\lambda)^2 - \sqrt{11}} \right)$$

$$+ \mathcal{L}^{-1} \left(\frac{2}{(s-\lambda)^2 - \sqrt{11}} \right)$$

$$= e^{\lambda t} \cos \sqrt{11} t + 2 e^{\lambda t} \sin \sqrt{11} t$$

$$k = v \quad v + 1 = \lambda$$

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$$\mathcal{L} \{ \sin \lambda t + \lambda e^{-t} - \lambda \cos \lambda t + \lambda - t \}$$

$$= \mathcal{L} \{ \sin \lambda t \} + \lambda \mathcal{L} \{ e^{-t} \} - \lambda \mathcal{L} \{ \cos \lambda t \}$$

$$+ \mathcal{L} \{ \lambda \} - \mathcal{L} \{ t \}$$

$$\downarrow \frac{\lambda}{s} \quad \downarrow \frac{\lambda}{s+1} \quad \downarrow \frac{-\lambda}{s^2 + \lambda^2} \quad \downarrow \frac{-\lambda}{s^2 + 9}$$

$$= \frac{\lambda}{s^2 + \lambda^2} + \frac{\lambda}{s+1} - \frac{\lambda s}{s^2 + 9} +$$

$$\frac{\lambda}{s} + \frac{\lambda}{s}$$

k=V k+1=V+1=1

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$$\int_0^{+\infty} \frac{1 \sin t}{t} dt \quad (e^{\pi})$$

$$f(t) = \sin t \quad F(s) = \mathcal{L}\left\{\sin t\right\} = \frac{1}{s^2+1}$$

$$\int_0^{+\infty} \frac{\sin t}{t} dt = \int_0^{+\infty} \frac{ds}{s^2+1}$$

$$= \text{ARC tan} \Big|_0^{+\infty}$$

$$= \text{ARC tan}(+\infty) - \text{ARC tan}(0)$$

$$= \frac{\pi}{2} - 0 = \frac{\pi}{2}$$

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$$X(s)(s-r) = rY(s) + X(0)$$

$$X(s) = \frac{rY(s) - X(0)}{s-r}$$

$$(s-1)Y(s) = -X(s) + Y(0)$$

$$Y(s) = \frac{-X(s) + Y(0)}{s-1}$$

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$$\begin{cases} \frac{dx}{dt} = rx + ry \\ \frac{dy}{dt} = -x + y \end{cases} \quad (b)$$

$$\frac{dy}{dt} = -x + y$$

$$\mathcal{L}\left\{\frac{dx}{dt}\right\} = r\mathcal{L}\{x(t)\} + r\mathcal{L}\{y(t)\}$$

$$\mathcal{L}\left\{\frac{dy}{dt}\right\} = -\mathcal{L}\{x(t)\} + \mathcal{L}\{y(t)\}$$

$$\mathcal{L}\{x(t)\} = X(s)$$

$$\mathcal{L}\{y(t)\} = Y(s)$$

$$sX(s) - X(0) = rX(s) + rY(s)$$

$$sY(s) - Y(0) = -X(s) + Y(s)$$

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$$t x''(t) - r t x'(t) - c x(t) = 0 \quad (r)$$

$$x(0) = 0$$

$$x'(0) = 1$$

$$\frac{d}{dt} x''(t) - c x'(t) - c x(t) = 0$$

$$L\{x''(t)\} - c L\{x'(t)\} - c L\{x(t)\} = 0$$

$$= L\{f\} = 0$$

$$s^2 X(s) - s x(0) - x'(0) - c s X(s) - c X(s) = 0$$

$$- r x(0) - r X(s) = 0$$

$$(s^2 - r s + r) X(s) = 1$$

$$X(s) = \frac{1}{s^2 - r s + r} = \frac{1}{(s-r)(s-r)}$$

$$= \frac{1}{(s-r)^2}$$

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$$L\left\{\frac{x''}{r} + \frac{c}{r} x' + c x\right\} = 0$$

$$\frac{x''}{r} + c L\{x'\} + c L\{x\} = 0$$

$$y = L\{x\} = \frac{x''}{r} + c L\{x'\} + c L\{x\} = 0$$

$$X(s) = \frac{1}{s-r} - \frac{1}{s-r} \quad (r)$$

$$X(t) = L^{-1}\left\{\frac{1}{s-r} - \frac{1}{s-r}\right\}$$

$$= e^{+rt} - e^{-rt}$$

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$$y'' + \frac{r}{m} y' - \frac{c}{m} y = 0$$

$$(rV' + rV'') + \frac{r}{m}(V + rV') - \frac{c}{m}(rV) = 0$$

$$rV' + rV'' + \frac{r}{m}V + rV' - \frac{c}{m}V = 0$$

$$rV' + rV'' = 0$$

$$w = V' \quad r w + r w' = 0$$

$$w' = V'' \quad w = e^{-\int r dx}$$

$$w = e^{-\frac{r}{m}x} + C_1$$

$$e^{-\frac{r}{m}x} \int r \cdot x dx + C = \frac{r}{m}x + \frac{C_1}{m}$$

$$w = V' = \frac{r}{m}x + \frac{C_1}{m}$$

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$$x''y'' + cxy' - cy = 0 \quad y = x \quad (r)$$

$$y' = 1$$

$$y'' = 0$$

$$x''(0) + c x(1) - c x = 0$$

$$0 + c x - c x = 0$$

$$c = 1 \quad y = x \quad c = 1$$

$$x''y'' + cxy' - cy = 0 \quad (\div x)$$

$$y'' + \frac{r}{m} y' - \frac{c}{m} y = 0$$

$$y = y_1 r = x r$$

$$y' = V + r V'$$

$$y'' = r V' + r V''$$

$$Ae^{\pi}(-9\cos\pi - 1\sin\pi) + Be^{\pi}(4\sin\pi - \cos\pi)$$

$$y^{(n)} = C_1 e^{e+\sqrt{r}} + C_2 e^{e-\sqrt{r}}$$

$$+ Ae^{\pi}(-9\cos\pi - 1\sin\pi)$$

$$+ Be^{\pi}(4\sin\pi - \cos\pi)$$

$$y_p = Ae^{\pi}\sin\pi + Ae^{\pi}\cos\pi + Be^{\pi}\cos\pi - Be^{\pi}\sin\pi$$

$$y_p = Ae^{\pi}\sin\pi + Ae^{\pi}\cos\pi + Ae^{\pi}\cos\pi - Ae^{\pi}\sin\pi + Be^{\pi}\cos\pi - Be^{\pi}\sin\pi - Be^{\pi}\cos\pi$$

$$= 2Ae^{\pi}\cos\pi - 2Be^{\pi}\sin\pi$$

$$y'' - \lambda y' - 4y = e^{\pi}\sin\pi$$

$$2Ae^{\pi}\cos\pi - 2Be^{\pi}\sin\pi - \lambda Ae^{\pi}\sin\pi$$

$$- \lambda Ae^{\pi}\cos\pi - \lambda Be^{\pi}\sin\pi + \lambda Be^{\pi}\cos\pi$$

$$- 4Ae^{\pi}\sin\pi - 4Be^{\pi}\cos\pi = e^{\pi}\sin\pi$$

$$- 4Ae^{\pi}\cos\pi - 4Be^{\pi}\sin\pi + 4Be^{\pi}\cos\pi - 4Ae^{\pi}\sin\pi$$

$$k = v \quad k + 1 = \lambda$$

$$y'' - ky' - 4y = e^{\pi}\sin\pi \quad (1)$$

$$y'' - \lambda y' - 4y = e^{\pi}\sin\pi$$

$$\lambda^2 - \lambda - 4 = 0$$

$$\Delta = b^2 - 4ac = 4^2 - 4 \times 1 \times -4 = 16 + 16 = 32$$

$$\sqrt{\Delta} = \sqrt{32} = 4\sqrt{2}$$

$$\lambda = \frac{1 \pm 4\sqrt{2}}{2}$$

$$\lambda_1 = 1 + 2\sqrt{2}$$

$$\lambda_2 = 1 - 2\sqrt{2}$$

$$y_p = C_1 e^{e+\sqrt{r}} + C_2 e^{e-\sqrt{r}}$$

$$y_p = Ae^{\pi}\sin\pi + Be^{\pi}\cos\pi$$

$$y_p = A_0 x + A_1 x^r$$

$$y_p = -\sqrt{x} - e^{\pi} x^r$$

$$k = v \quad k + 1 = \lambda$$

$$y'' - y' = \lambda x - 1 \quad (2)$$

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

$$\lambda = 0 \quad \lambda = 1$$

$$y_p = x(A_0 + A_1 x) = A_0 x + A_1 x^2$$

$$y_p' = A_0 + 2A_1 x$$

$$y_p'' = 2A_1$$

$$y'' - y' = \lambda x - 1$$

$$2A_1 - (A_0 + 2A_1 x) = \lambda x - 1$$

$$2A_1 - A_0 = -1 \Rightarrow -\lambda - A_0 = -1$$

$$A_0 = 1$$

$$-2A_1 = \lambda \Rightarrow A_1 = -\frac{\lambda}{2} = -\frac{1}{2}$$

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$$\int y' dy = \int \left(\frac{1}{r} c_1 n^r + c_2 \right) dn$$

$$y = \frac{1}{r} c_1 n^r + c_2 n + c_3$$

$$y = c_1 n^r + c_2 n + c_3$$

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$K = v \quad K+1 = \Lambda$

$$y''' - \frac{K}{n} y'' = 0 \quad (*)$$

$$y''' - \frac{\Lambda}{n} y'' = 0$$

$$u = y'' \rightarrow u' = y'''$$

$$u' - \frac{\Lambda}{n} u = 0$$

$$u' = \frac{\Lambda}{n} u$$

$$\int u' du = \int \frac{\Lambda}{n} u$$

$$u(n) = c_1 n$$

$$y'' = c_1 n$$

$$\int y'' dy = \int c_1 n dx$$

$$y' = \frac{1}{r} c_1 n^r + c_2$$

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$$u = y^{-r}$$

$$\downarrow$$

$$n^{-\frac{1}{r}} + \frac{r}{r} n^{\frac{r}{r}} + Cn = y^{-r}$$

$$y = \sqrt[r]{n^{-\frac{1}{r}} + \frac{r}{r} n^{\frac{r}{r}} + Cn}$$

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$$y' - \frac{y}{rn} = -y^{\frac{1}{r}} \quad (2)$$

$$-y^{\frac{1}{r}} y' + y^{\frac{1}{r}} \times \frac{1}{rn} = 1$$

$$u = y^{-r} \quad u' = -r y^{-r-1} y'$$

$$\frac{1}{r} u' + \frac{1}{rn} u = 1$$

$$u'(n) = e^{\int \frac{1}{rn} dn} = e^{\frac{1}{r} \ln n} = n^{\frac{1}{r}}$$

$$= e^{\frac{1}{r} \ln n} = e^{\ln n^{\frac{1}{r}}} = n^{\frac{1}{r}}$$

$$u = n^{-\frac{1}{r}} \left[\int \frac{1}{n^{\frac{1}{r}+1}} dn + C \right]$$

$$u = n^{-\frac{1}{r}} \times \frac{n^{\frac{1}{r}+1}}{\frac{1}{r}+1} + Cn$$

$$u = n^{-\frac{1}{r}} + \frac{r}{r} n^{\frac{r}{r}} + Cn$$

$$y_p = C_1 x + C_2 (x^r - 1) \quad *$$

$$y_p = V_1 x + V_2 (x^r - 1)$$

$$V_1' x + V_2' (x^r - 1) = 0$$

$$V_1' + r V_2' x = \lambda (x^r + 1)$$

$$V_1' = -\lambda (x^r - 1) \quad V_2' = \lambda x$$

$$V_1 = \int -\lambda (x^r - 1) dx \quad V_2 = \int \lambda x dx$$

$$V_1 = -\lambda \frac{x^{r+1}}{r+1} + \lambda x \quad V_2 = \lambda \frac{x^2}{2} = \frac{\lambda}{2} x^2$$

$$y_p = \left(-\lambda \frac{x^{r+1}}{r+1} + \lambda x\right) x + \frac{\lambda}{2} x^2 (x^r - 1)$$

$$y = C_1 x + C_2 (x^r - 1) + \left(-\lambda \frac{x^{r+1}}{r+1} + \lambda x\right) x + \frac{\lambda}{2} x^2 (x^r - 1)$$

$$(x^r + 1) y'' - r x y' + r y = \lambda (x^r + 1)^r (e^{\frac{1}{x^r+1}})$$

$$y'' - \frac{r x}{(x^r + 1)} y' + \frac{r}{(x^r + 1)} y = \lambda \frac{(x^r + 1)^r}{(x^r + 1)}$$

$$y'' - \frac{r x}{(x^r + 1)} y' + \frac{r}{(x^r + 1)} y = 0$$

$$y_1 = x \quad \text{check}$$

$$V = \int \left(\frac{1}{x^r} e^{\int \frac{r x}{x^r + 1} dx} \right) dx$$

$$\int \frac{x^r + 1}{x^r} dx = x - \frac{1}{x}$$

$$y_2 = x^r - 1 \quad \text{check}$$

$$u = \frac{1}{x^{\frac{1}{r}} (x^r + y^r)} \quad \frac{1}{x^{\frac{1}{r}} (x^r + y^r)} dx + \lambda x y dy = 0$$

$$\int \left(x^{\frac{1}{r}} + x^{-\frac{1}{r}} y^r \right) dx + \lambda x^{\frac{1}{r}} y dy = 0$$

$$M(x, y) = x^{\frac{1}{r}} + x^{-\frac{1}{r}} y^r$$

$$N(x, y) = \lambda x^{\frac{1}{r}}$$

$$M_y = r y x^{-\frac{1}{r}} = -N_x$$

$$N_x = r x^{-\frac{1}{r}}$$

$$\int \left(x^{\frac{1}{r}} + x^{-\frac{1}{r}} y^r \right) dx = - \int \lambda x^{\frac{1}{r}} y dy$$

$$\frac{x^{\frac{1}{r}+1}}{\frac{1}{r}+1} + \frac{x^{-\frac{1}{r}} y^r}{\frac{1}{r}} = -\lambda x^{\frac{1}{r}} \frac{y^2}{2}$$

$$\frac{r}{2} x^{\frac{1}{r}+1} + \frac{r}{2} x^{-\frac{1}{r}} y^2 + \frac{r}{2} x^{\frac{1}{r}} y^2 + C$$

$$(x^r + y^r) dx + \lambda x y dy = 0 \quad (*)$$

$$M(x, y) = x^r + y^r$$

$$N(x, y) = \lambda x y$$

$$M_y = r y \neq N_x$$

$$N_x = \lambda y$$

$$g(x) = \frac{y y - \lambda y}{\lambda x y} = \frac{-y y}{\lambda x y} = -\frac{r}{x}$$

$$u(x) = e^{\int g(x) dx} = e^{\int -\frac{r}{x} dx} = e^{-\frac{r}{x}}$$

$$= e^{-\frac{r}{x} \ln x} = e^{\ln x^{-\frac{r}{x}}} = x^{-\frac{r}{x}}$$

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$$(x+y^r)dx - rxy dy = 0 \quad \text{① (الف)}$$

$$\begin{aligned} M(x,y) &= x+y^r & M_y &= ry \\ N(x,y) &= -rxy & N_x &= -ry \end{aligned} \quad \neq$$

$$g(x) = \frac{M_y - N_x}{N} = \frac{ry - (-ry)}{-ry}$$

$$\frac{ry^0}{-ry} = -\frac{r}{x}$$

$$M(x) = e^{\int g(x) dx} = e^{\int -\frac{r}{x} dx}$$

$$= \cancel{e}^{-r \int \frac{1}{x} dx} = e^{-r \ln x}$$

$$= e^{\ln x^{-r}} = x^{-r}$$

$$x^r(x+y^r)dx - rxy dy = 0$$