Subject lecture 7 موضوع الدرس Date التاريخ

Solve for x

1) $x = P^3$

$\frac{dx}{dy} = 3P^2 \frac{dP}{dy}$

$\frac{1}{P} = 3P^2 \frac{dP}{dy}$

$dy = 3P^3 dP$

$y = \frac{3}{4} P^4 + C$

$\boxed{y = \frac{3}{4} x^{4/3} + C}$

2) $x = 4(P^3 + P)$

$\frac{dx}{dy} = 4(3P^2 \frac{dP}{dy} + \frac{dP}{dy})$

$\frac{1}{P} = (4 + 12P^2)\frac{dP}{dy}$

$dy = (4P + 12P^3) dP$

$\boxed{y = 2P^2 + 3P^4 + C}$

3) $3x = \frac{y}{P} - 6y^2 P$

$\frac{3}{P} = P^{-1} - yP^{-2}\frac{dP}{dy} - 12yP - 6y^2 \frac{dP}{dy}$

$0 = -(yP^{-2} - 6y^2)\frac{dP}{dy} - (\frac{2}{P} + 12yP)$

$0 = -y(P^{-2} + 6y)\frac{dP}{dy} - 2P(P^{-2} + 6y)$

$0 = -(P^{-2} + 6y)\left[y\frac{dP}{dy} + 2P\right]$

$y\frac{dP}{dy} + 2P = 0$

$\frac{2\,dy}{y} = \frac{-dP}{P}$

$2\ln y = -\ln P + \ln c$

$y^2 = \frac{c}{P} \rightarrow P = \frac{c}{y^2}$

$\boxed{3x = \frac{y^3}{c} - 6c}$

★ Solve For y :

1) $y = 2P(x-1)$

$P = 2P + 2(x-1)\frac{dP}{dx}$

$-P = 2(x-1)\frac{dP}{dx}$

$\frac{-dx}{x-1} = \frac{2\,dP}{P}$

$-\ln(x-1) = 2\ln P + \ln c$

$P^2 = \frac{c}{x-1} \Rightarrow P = \sqrt{\frac{c}{(x-1)}}$

$y = \frac{2(x-1)\cdot c}{\sqrt{x-1}}$

$y = 2c\sqrt{x-1}$

2) $y = 2P^3 + \frac{1}{P} \rightarrow P = 6P^2 \frac{dP}{dx} - \frac{1}{P^2}\frac{dP}{dx}$

$\cancel{P} = \cancel{P}(6P - \frac{1}{P^3})\frac{dP}{dx} \Rightarrow 1 = (6P - \frac{1}{P^3})\frac{dP}{dx}$

$x = 3P^2 + \frac{1}{2P^2} + C$

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$\boxed{3}$ $y=(x-a)p-p^2$ $\qquad p+x\frac{dp}{dx}$

$\cancel{p}=(x-a)\frac{dp}{dx}+\cancel{p}-2p\frac{dp}{dx}$

$0=(x-a-2p)\frac{dp}{dx}$

$\frac{dp}{dx}=0 \rightarrow p=c \rightarrow y=(x-a)c-c^2$

unknown

$\star \int_0^\infty t^5 e^{-t}\,dt=\Gamma(n)=\Gamma(4+1)=4!$

$y=px+f(p) \rightarrow \cancel{p}=\cancel{p}+x\frac{dp}{dx}+f'(p)\frac{dp}{dx}$

$0=(x+f'(p))\frac{dp}{dx} \Rightarrow \frac{dp}{dx}=0 \rightarrow p=0$

$y=cx+f(c)$

$\boxed{1}$ $y=xp+\sqrt{4+p^2}$

$p=c$

$y=cx+\sqrt{4+c^2}$

② $y=xp+e^p$

$p=c$

$y=xc+e^c$

③ $(y-xp)^2=1+p^2$

$y=xp+\sqrt{1+p^2}$

$\boxed{4}$ $\ln(y-xp)=p$

$y=xp+e^p$

⑤ $\cos(y-xp)=p^2$

$y=xp+\cos^{-1}p^2$