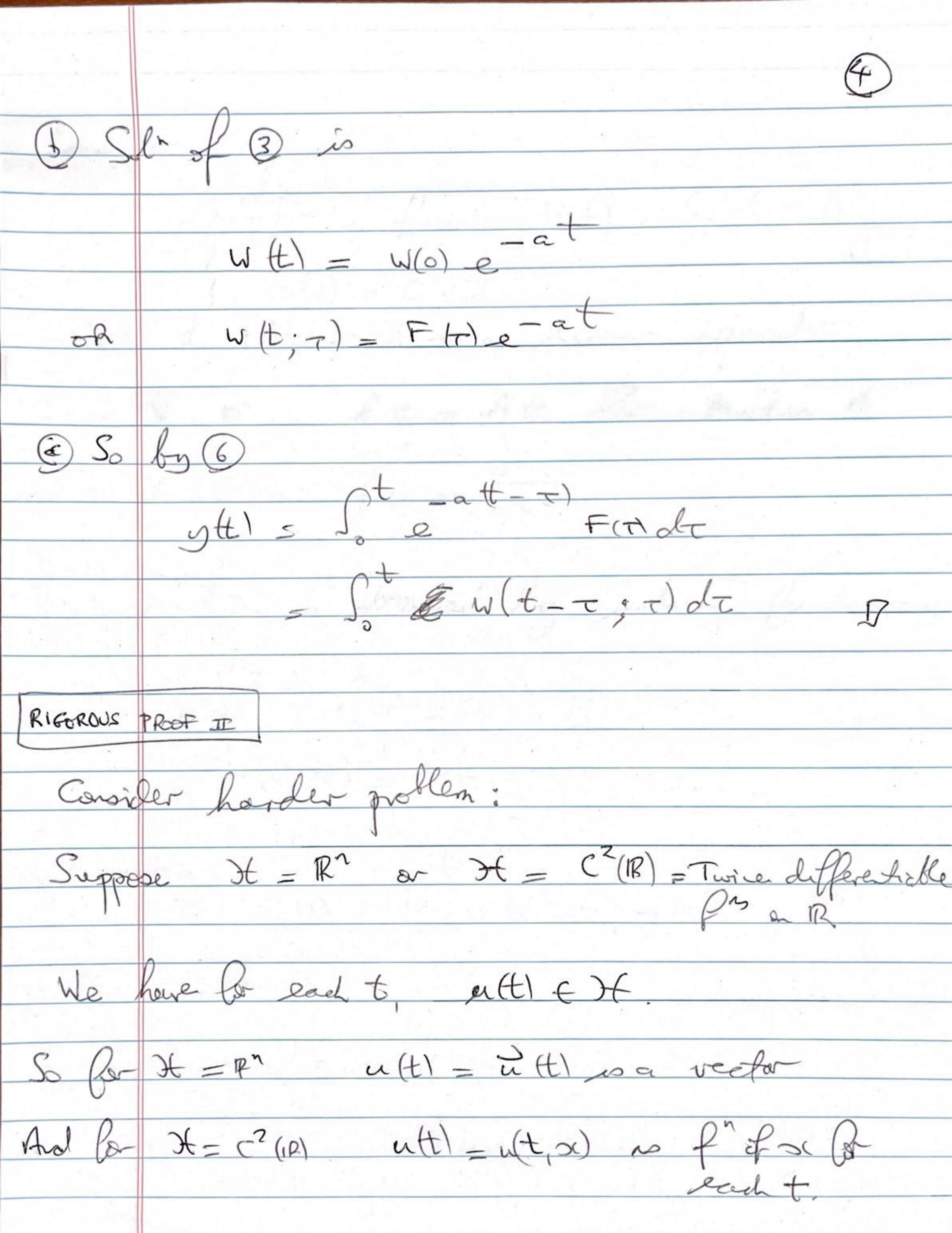
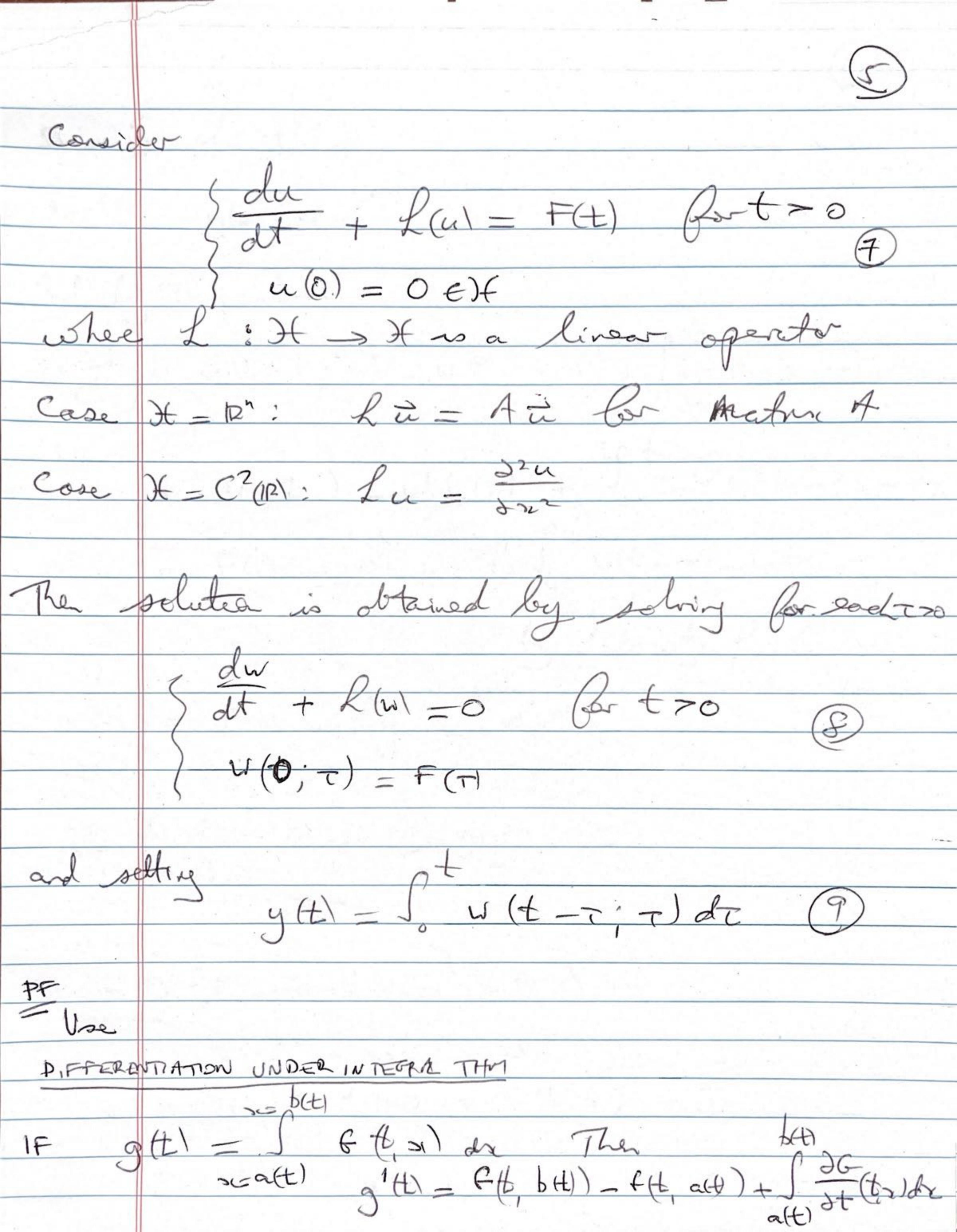
[JR,#9]	HEAT EQUATION ON IR WITH SOURCES: DUHAMAZ'S PRINCIPLE
EDMZ:	SOLVE IVP Br u=u(t,):
>	$\frac{\partial u}{\partial t} = D \frac{\partial^2 u}{\partial x^2} + F(t, x) \qquad \text{set } R, \ t > 0$
\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	u(0,x)=0
	F=F(tx) is a given function modeling
2	beat sources/sinks, a "Forcing Runcha
MOTIVA	Fron: from simple forced out IVP for y=ytt):
	1 dy
	3 dt + ay = t(t)
	(y(0) =0
DUHAMI	L'S PRINCIPLE
Far	each To consider Te IVP Por w=w(t; -)
	$\begin{cases} \frac{dW}{dt} + aW = 0 \end{cases}$
	$(W(0) = W(0, \tau) = F(\tau)$

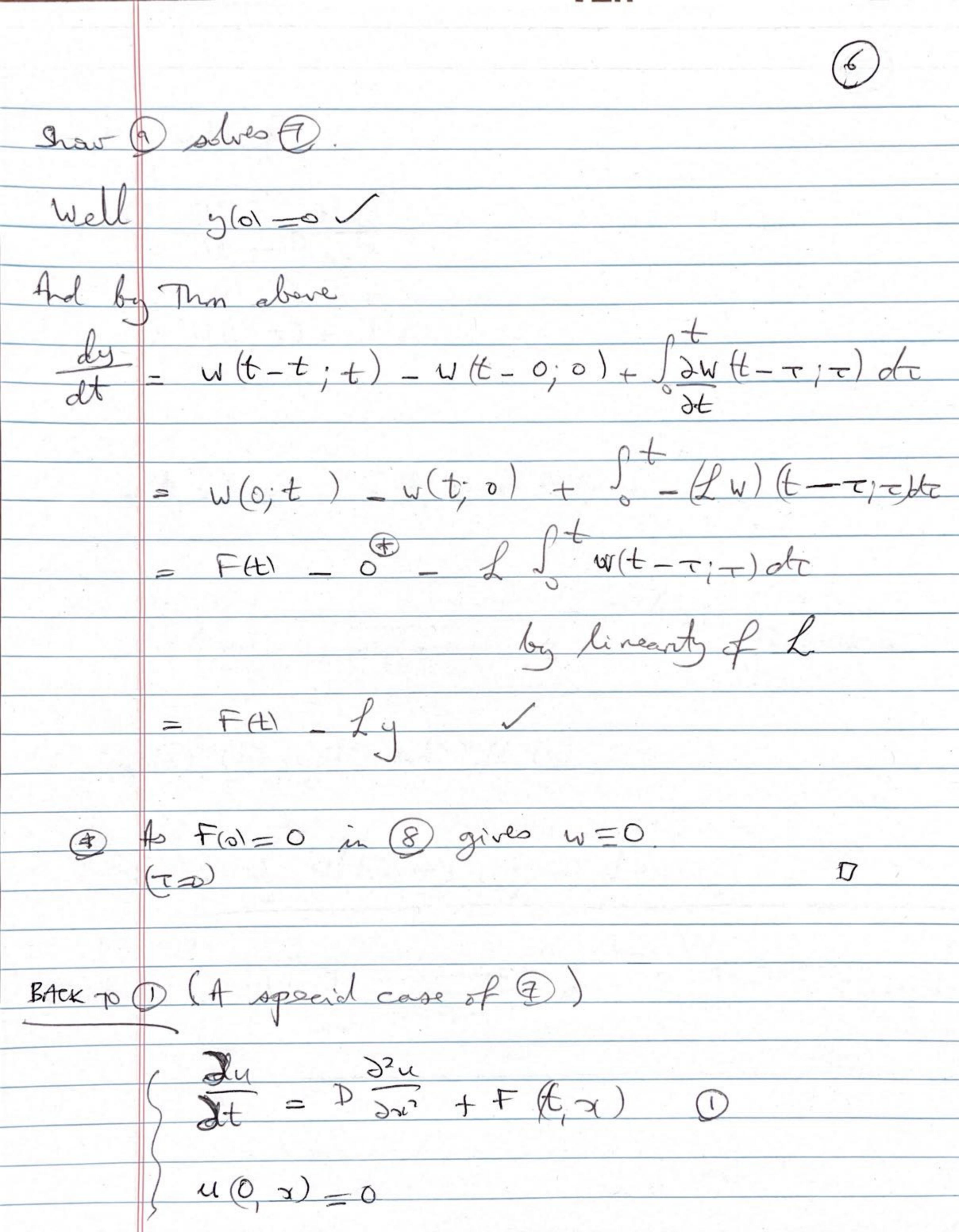
	2
Then	$y(t) = \int_0^t w(t - \tau, \tau) d\tau \qquad (4)$
12010	
ind	give the source F(t) only acts for on at (Fin inpulsive): F(t) = F(T) f(t-T) for some To
So	ts like we are solving
	$\begin{cases} \frac{ds}{dt} + ay = 0 & t > \tau \\ y(t) = F(\tau) \end{cases}$
and	setting gH =0 for t < T.
or wit	$w(t) = g(t + \tau):$
	$\begin{cases} \frac{dw}{dt} + av = 0 & t > 0 \\ w(0) = F(t) \end{cases}$
S	$y(t) = 0$ $y(t) = w(t - \tau)$ $pr t > \tau$

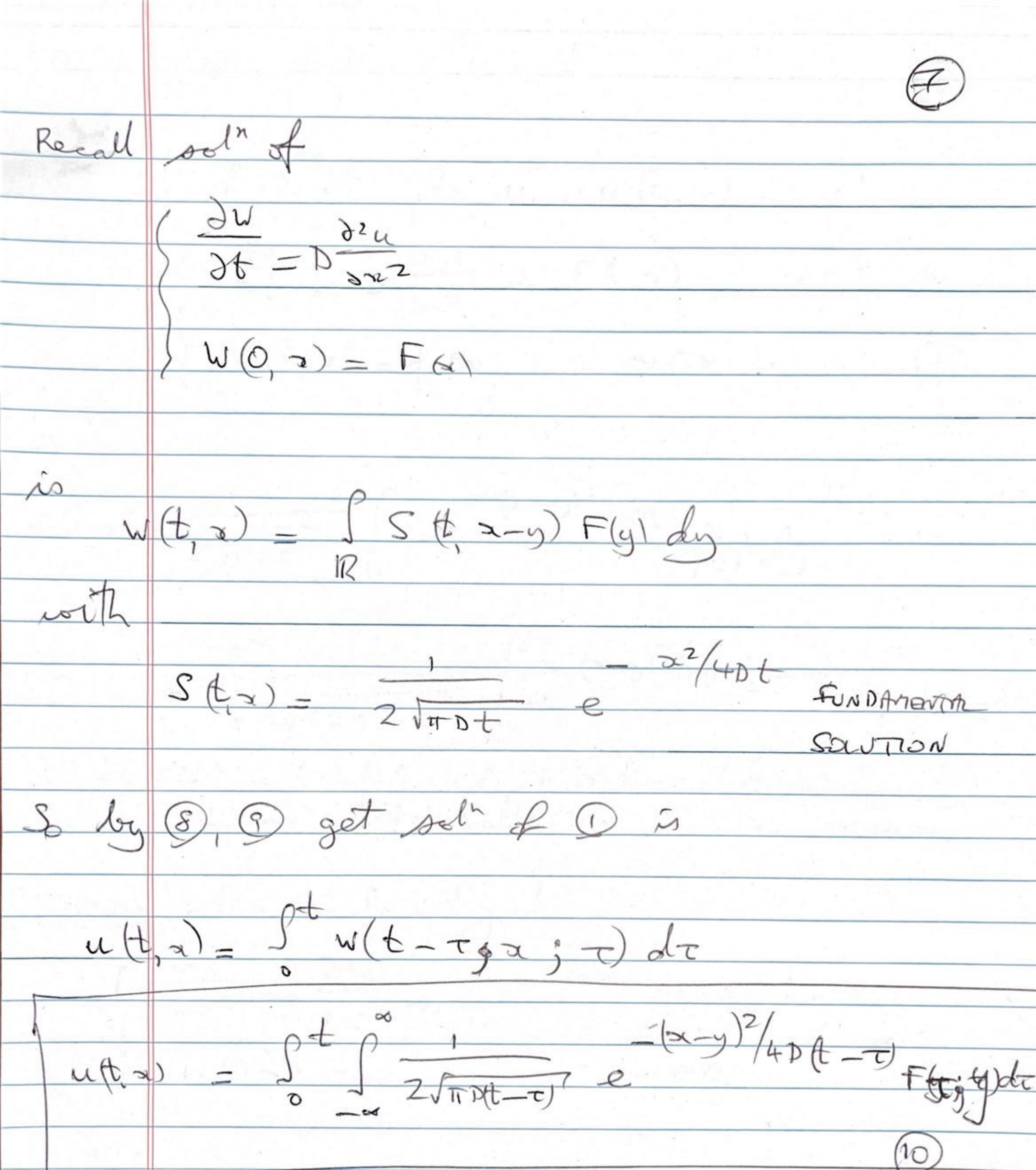
	3
Instead	Le f an impulsive force, for general ce, F = Fitti ve have
	$F(t) = \int_{R} F(t) \int_{R} (t - \tau) d\tau$
Solon	Principle of Superpostan we would
	$y(t) = \int w(t-\tau;\tau) d\tau$
RIEROS	PROOF I
@ Using	natignating factors solution of Q is
	$y(t) = \int_{e}^{t} e^{-a(t-s)} F(s) ds \qquad (6)$
	at (e yt) = e (ay + g1) = e + FA
S	taking It;
	e ytt) = Joe Fisiks

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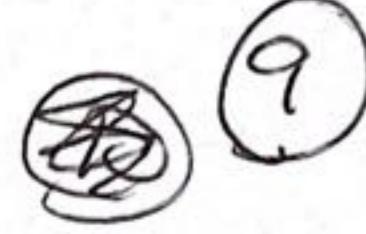








By Principle of Superposition set THM SUN of IVP Por u = u(t, x) 3 du = D dr + + (x) u(0, 0) = f(a) in se and once differentiable the int, Then so is u Example where can do integral. 1 3t - 2x + for oc-12 + >0 (Q x) _0 SCER



 $u(t, x) = \int_{-\infty}^{\infty} \left[\frac{1}{R} \int_{-\infty}^{\infty}$ $u(t,x) = x \int_{-\infty}^{\infty} dz = \frac{st^2}{z}$