Assignment - 2 ISHIKA

Problem-1

Jornula For Continuous 1-13 Fourier transform

 $F[f](u) = \int_{-\infty}^{\infty} f(n) e^{-i2\pi u n} dn$ 

a) Unearity

To prove: F[af(n) + bg(n)](u) = af[f](u) +
b F[g](u)

Let h(n) = af(n) + bg(n)

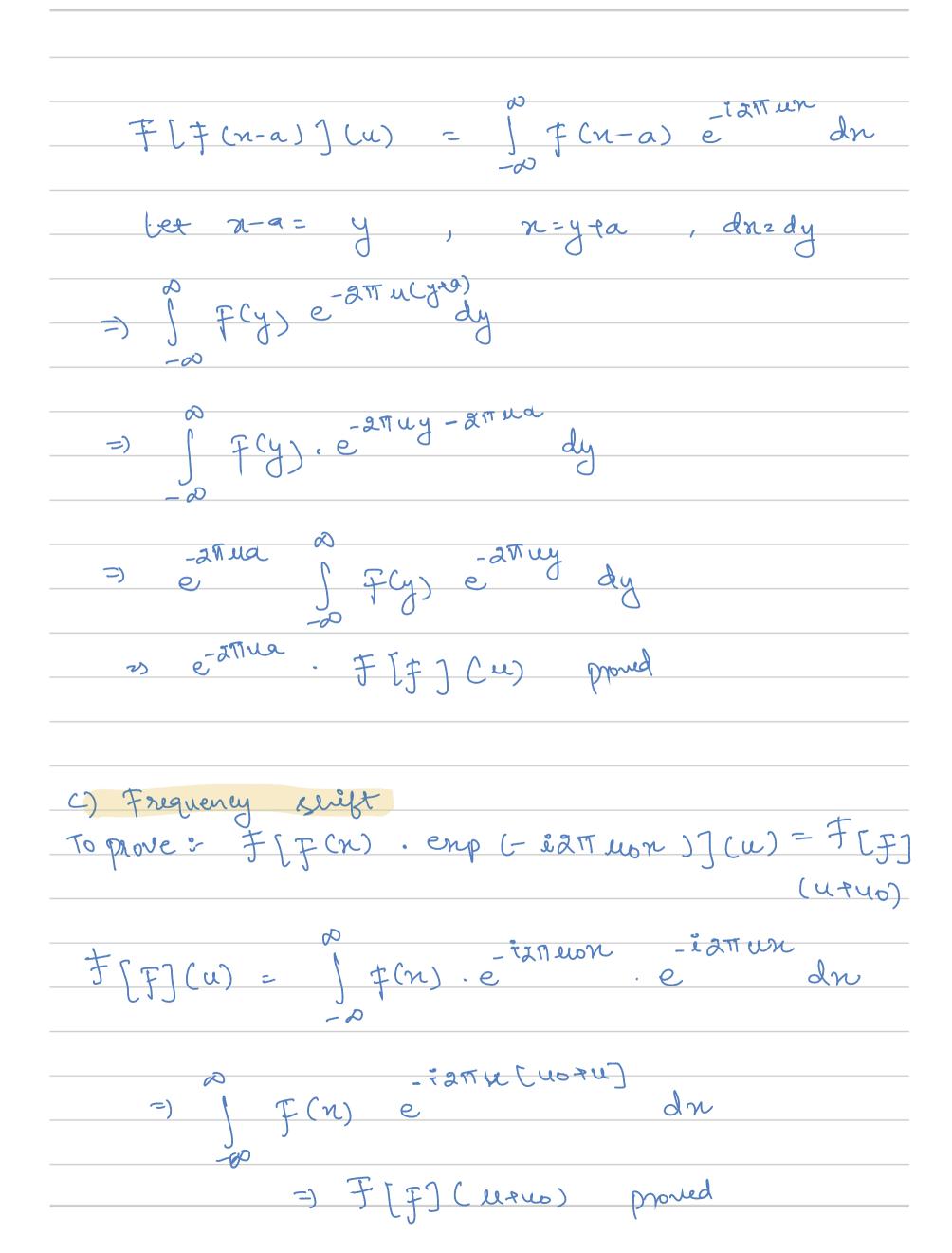
F[h](u) = f(af(n) + bg(n)) e dn

=) d f f(n) e dn + b f g(n) e dn -00

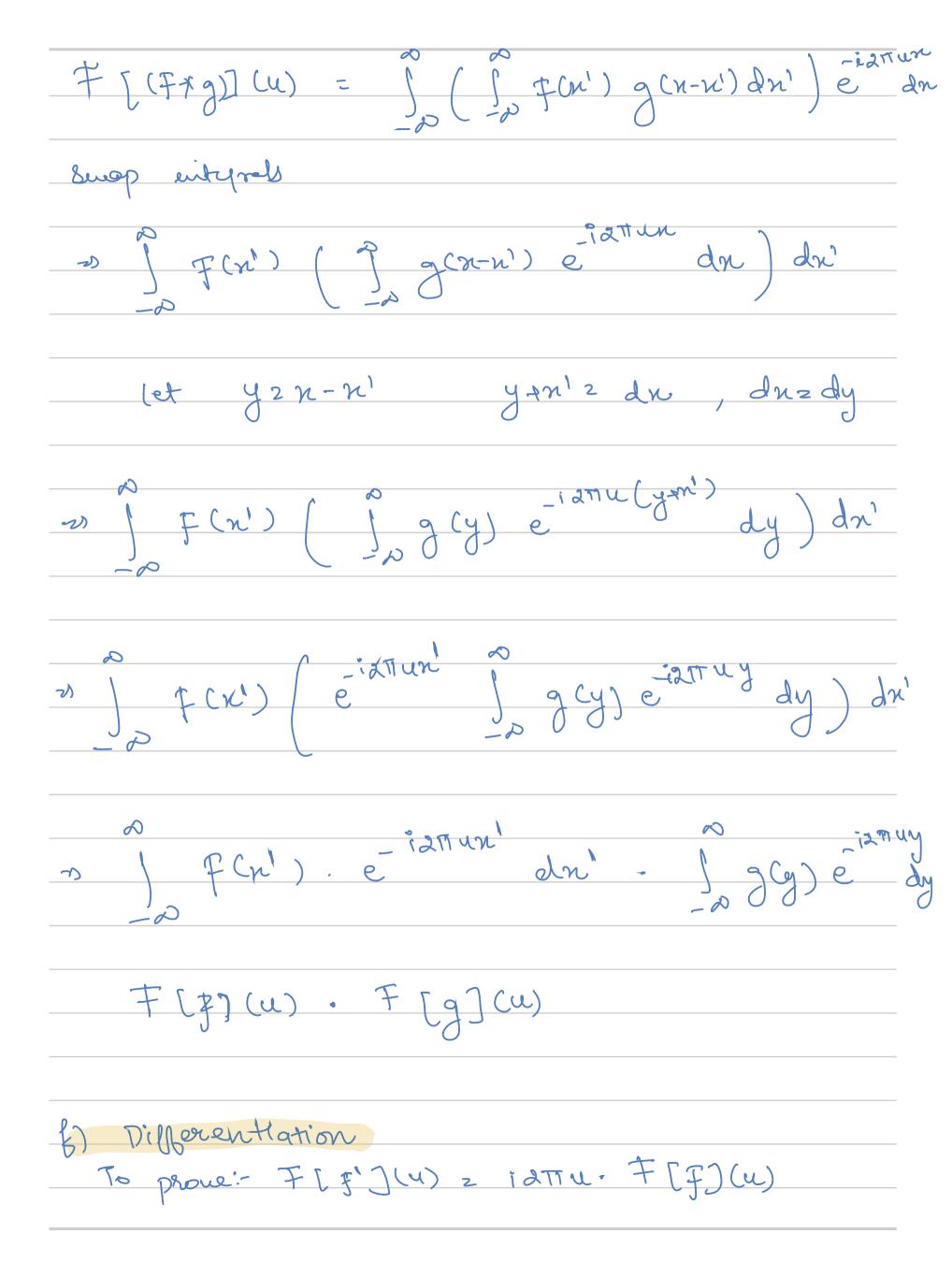
=) a F[F](u) + b F[g][u] proved

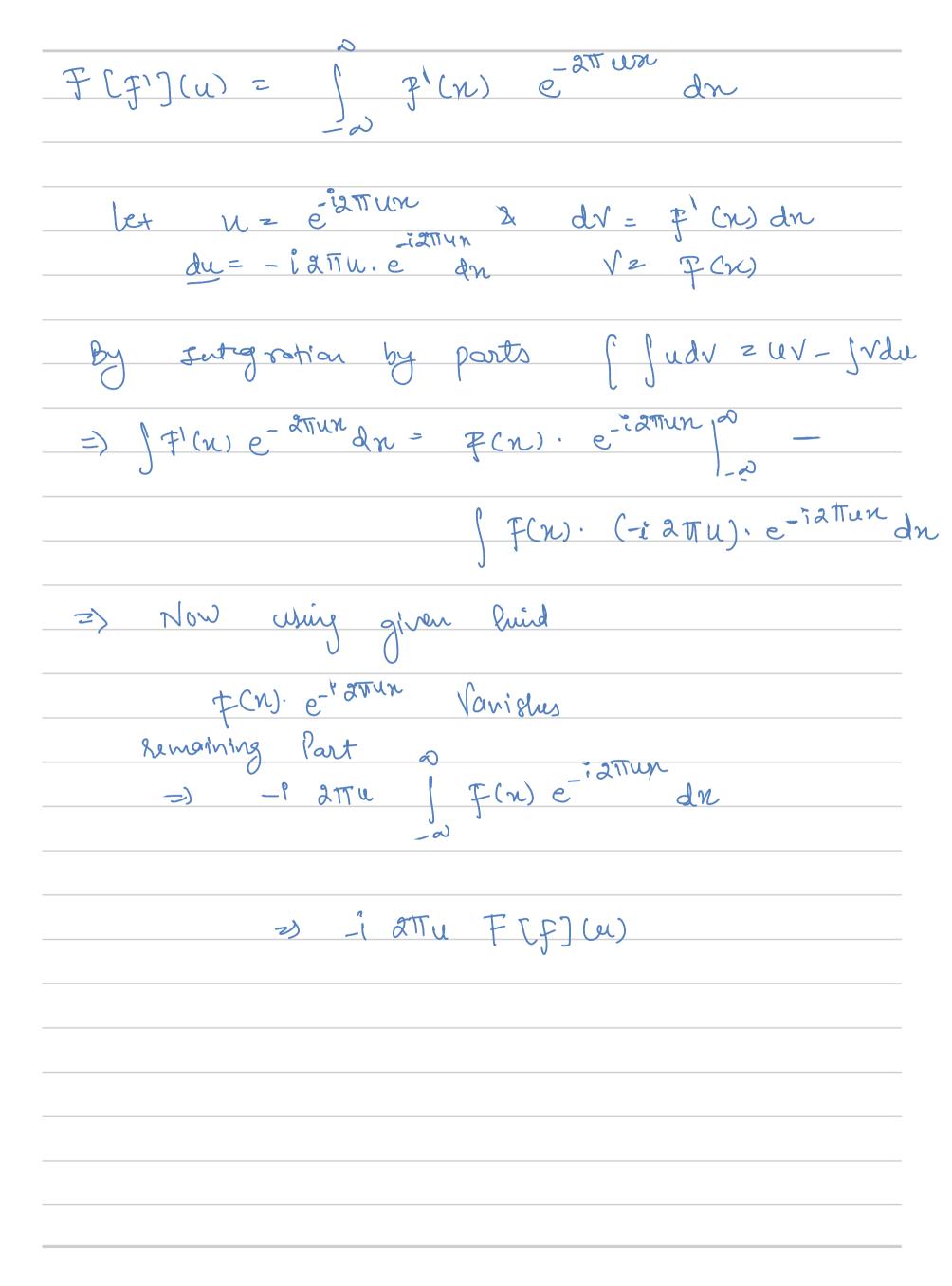
b) Spatial Shift

To prove: F[f(n-a)](u) = enp (- ? arrua). +[f](i)



d) Scaling To place: TCf can )] (u) = 1 . F[f] (=) By Formula FJeu = | f(an) · e let yzan zn=ya dn=jady => \( \) \( => 1 00 F(y) e 2MU (Y/a) dy e) Convolution Popule: - F[Cf xg) (n)] (u) = F[f](u) + f[g](u) we know Convolution formula  $(F*g)(n) = \int F(n')g(n-n')dn'$ 





Problem 2
geneu Function
0 '
(n 4-3)
$n^2 + 6n + 9$ $C - 3 < n \leq -1$
f(n) = 16
$\begin{cases} 6-2n^2 & (-1 < n \leq 1) \end{cases}$
16
n2-6n+9 (1 Cn 63)
C 22>3
This is the result what we got when
we solved Problem 4 for h2 (n) in
MW 1
$\frac{h_2(n)}{vhere} = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$
where
$g(n) = \begin{cases} 42 & (-1 \le x \le 1) \\ 0 & \text{else} \end{cases}$
o else
Jourier trougform
f(g) (u)=) f(n) e 2 mium dn

F(g)(u)2 / 1 e-2#ivndn
$= \frac{2\pi i u}{2}$ $= 2\pi i u$
$\frac{1}{2} \left( \frac{e}{-2\pi i u} \right)^{-1}$
-2 TTIL
Now we know by Euler Johnsola
Sin 0 = e'0 - e'0
en e = 2isin(atru)
e - e - arsin Carra
20
$f(gf(u)) = \frac{1}{2} \left( -\frac{2r \sin(2\pi u)}{-2\pi i u} \right)$
2 = attiu
1 (2SIn(2TU)
2 (dSIn(aTU))
Z SIN (ATTU
2774
normalizing the Function

Flg](u) = Sinc (2Tu)	
	_
Now hgty] = $g + g + g = f(n)$	_
	_
3	
F[f](u) = (Sinc Catu))3	
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