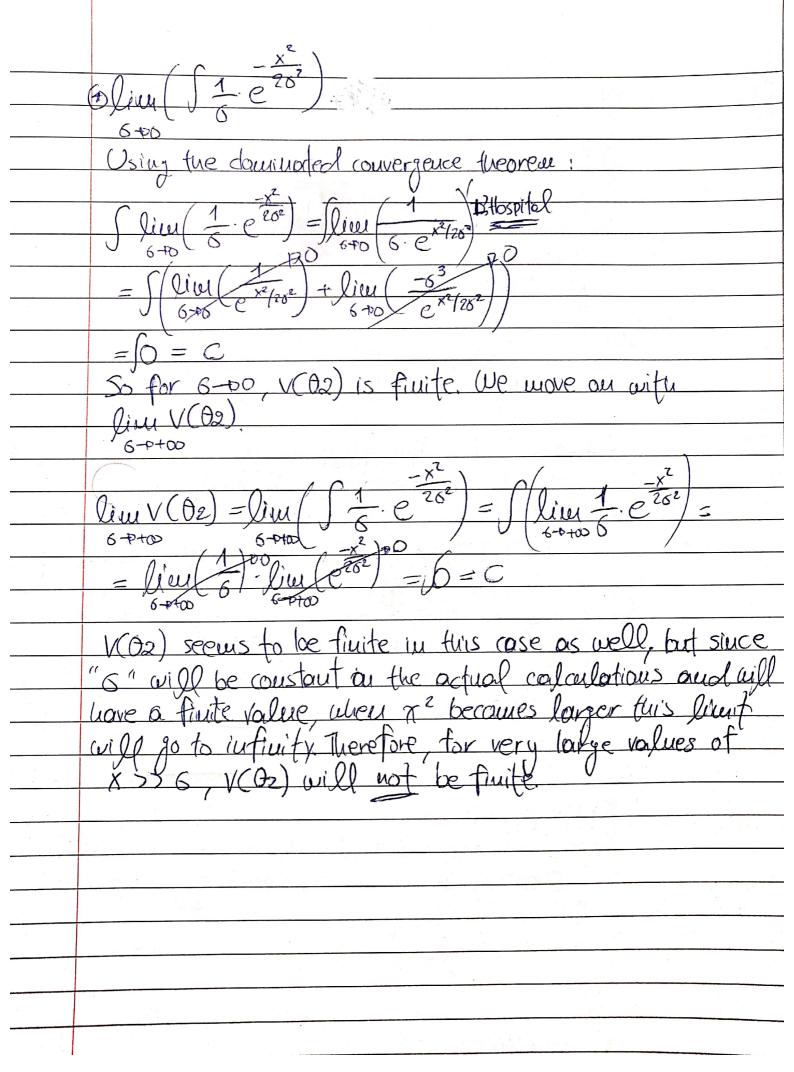
	Simulation
	Assignment 4 Platon
	Kouragenrais
	Korrageorgis 73180068
	1) We will prove that O1, O2 one aubiosed
	For Oal
	$F[01] = E[\frac{1}{u} \cdot \stackrel{?}{\underset{i=1}{\sum}} \Phi(y_i \cdot 6)] = \frac{1}{u} \cdot \stackrel{!}{u} \cdot E[\Phi(6y_i)] =$
	/
	$= \int \varphi(6\cdot x) \cdot f(x) dy = \int \varphi(6x) \cdot \frac{-x^2}{2} dx$
	VZN
	Set x = 4.5 = 0 dx = 6 dy = 0 dy = 0 dx
ı,'	The state of the s
	And we get, $\int \rho(x) \cdot e^{\frac{-x^2}{2\delta^2}} \frac{1}{\delta \sqrt{2D}} dx = E[\rho(x)] = \mu$
	0 / C GVZn
•	For O2
	$\frac{1}{\sqrt{\frac{1}{25^2} - \frac{1}{2}}}$
1	$E[\theta_2] = E[\frac{1}{n6} \cdot \underbrace{\sum_{i=1}^{n} \left(e^{\frac{-y(26^2-2)}{26^2}} \Phi(y) \right)}] =$
	$\frac{2\left(1-\frac{1}{2}\right)}{2\left(2-\frac{1}{2}\right)}$
	$= \frac{1}{46} \cdot \text{h.} \text{E[e^{-\text{Y.}(\frac{1}{26^2} - \frac{1}{2})}, \varphi(\text{Y})]} =$
	MO $-\frac{2}{3}\left(\frac{1}{2}-\frac{1}{2}\right)$ $-\frac{2}{3}$
	$= \frac{1}{6} \cdot \int_{C}^{-\frac{2}{3}(\frac{1}{26^2} - \frac{1}{2})} \frac{-\frac{2}{3}}{\sqrt{2}n} dy = \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} dy = \frac{1}{\sqrt{2}}$
	$\frac{\sqrt{2}}{\sqrt{2}}$
-	$= \frac{1}{6} \cdot \frac{1}{\sqrt{20}} \cdot \left(e^{\frac{7}{26^2}} \cdot \varphi(y) \cdot e^{\frac{7}{2}} dy \right) = \frac{1}{6} \cdot \frac{1}{\sqrt{20}} \cdot \left(e^{\frac{7}{26^2}} \cdot \varphi(y) \cdot dy \right)$
	5 7211
	$= E[\varphi(x)] = \psi$
	Now that both estimators are in fact unbiased are will colonate the variances.
	Now that both estimators are in fact unbiased are
	will coloulate the variances

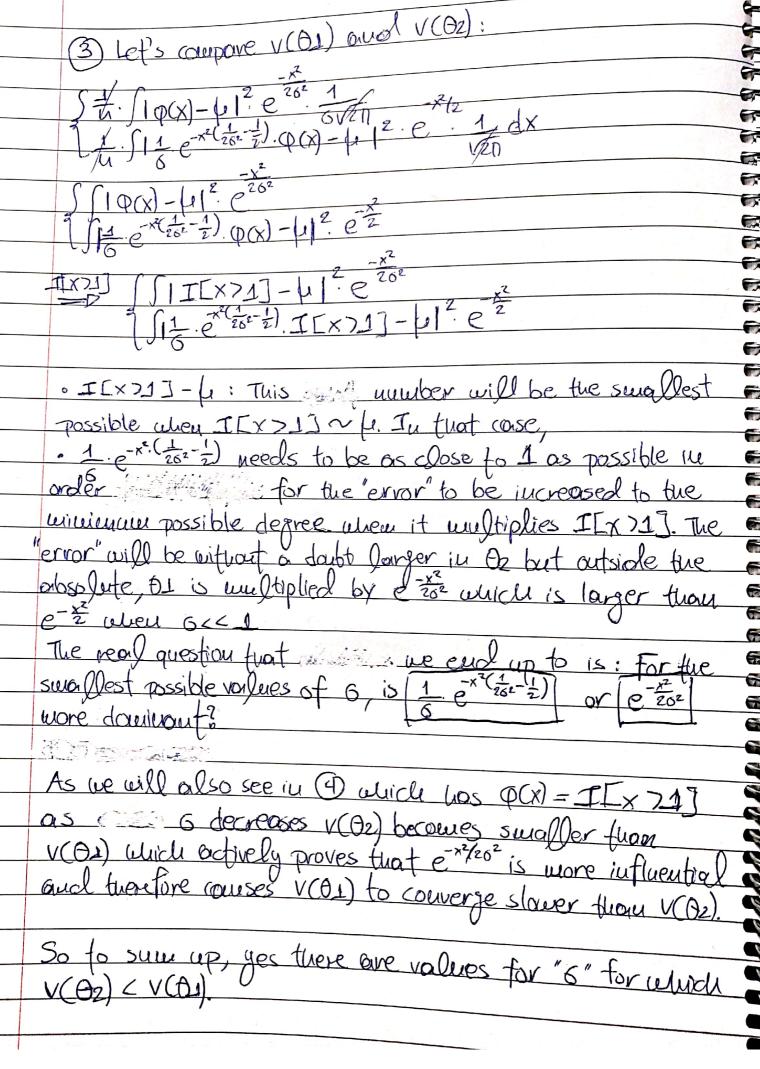
For 61 $V(O_1) = V\left(\frac{1}{\mu} \cdot \Phi(6Y_i)\right) = \frac{1}{\mu} \cdot V(\Phi(6Y_i)) =$ $= \frac{1}{11} \int |\varphi(6y) - |\rho|^2 \cdot e^{\frac{-y^2}{2}} \frac{1}{\sqrt{21}} dy = 0$ $V(\theta_1) = \frac{1}{1} \int |\varphi(x) - \mu|^2 e^{\frac{-x^2}{26^2}} \frac{1}{1}$ For Oa $V(\theta_2) = V\left(\frac{1}{16} \cdot e^{-\frac{1}{2}(\frac{1}{26^2} - \frac{1}{2})}\right)$ $= \frac{1}{u} \cdot \int_{\mathbb{R}^{2}} e^{\frac{1}{26^{2}}} \frac{1}{2} \cdot \varphi(y) - |u|^{2} \cdot e^{\frac{1}{2}} \cdot \frac{1}{\sqrt{2\pi}} dy =$ $= \frac{1}{U} \cdot \int \left| \frac{1}{28^2} \cdot \frac{1}{2} \right| \frac{1}{28^2} \cdot \frac{1}{2} \cdot$ (2) lu order to prove for unich values of "6"

ν(θ2)-000 ue need to calculate the

lim ν(θ2) and lim ν(θ2) since 6 € (0,+00).

6-00 First we colculate live V (O2), but we don't need to deep the entire things for our confinitions. lie (1 1/2 e 262 - 2. 0 () - (1 2 e 2. 1) We will calculate a simplified version that will also do the job for us





•	
_	For this part we set $\varphi(x) = I[x] I]$ and proceed on conferlating DI DD. The function has "6" as on attribute so it is easy to run experiments. The code also conferlates
_	Confordating Os Os. The function has "6" as an attribute so
	it is easy to my experiments. The coole pulse contra lates
	the vorigues and tingly gerlance a quick total that
	vailables the fort that B1. B2 one indeed valid estimators
	for le and are also aubiased.
	voilidates the fact that 01,02 are indeed valid estimators for and are also unbiased. • When we set 6 << 1 we can see proof of 3
	· For 6771 like we explained in (2) V(O2) loses its
	predslau.
_	
	· · · · · · · · · · · · · · · · · · ·
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