	Quantum Computing - Theory Work for Lab #2 Alexandra Semposk
	1). Verify that:
	2N 2N 2N
"	(σ _z)=1. Σρ. (c; σ _z c;)=1 Σρ. (n; -n;)=1. Σρ. (N-2)
	Nil Ni
	is equivalent to measuring:
	The beauty of the second of th
	⟨₹1 <u>T</u> I <u>T</u> + <u>T</u> ₹1 <u>T</u> <u>I</u> + <u>T</u> 1 <u>T</u> ₹1 <u>I</u> + + <u>T</u> III <u>I</u> ₹⟩.
	The state of the s
	For 3 qubits, (ZII + IZI + IIZ).
	The state of the s
	10; can be any of the 23 states: 1000, 1010, 1011, 1100
	(111) (100) (101)
4	<000 ZII 000) + <000 IZI 000) + <000 IIZ 000) = 1+1+1=3.
	<000 0007=1 <000 000>=1 <000 000>=1
-	The state of the s
	<010 ZII 010 + <010 IZI 010 > + <010 IIZ 010 > = 1.
	<010/010>=1 -<010/010>=-1 <010/010) =1
	$\langle olo olo \rangle = 1$ $-\langle olo olo \rangle = -1$ $\langle olo olo \rangle = 1$
	The state of the s
	(011 ZII 011) + (011 IZI 011) + (011 IIZ 011) = -1.
	<011/011/2=1 -<011/011/2=-1
	<1001 SII 100) + <1001 I ZI 100) + <100 II Z 1 100) = 1.
	$-\langle 100 100\rangle = -1$
	<110 ETT 110> + <110 IZI 110> + <110 IIZI 110> = -1.
1	
	-<110/11>- 1-5(011/ ESI/011>- 1-3(011/011>-
	<101 ZII 1101) + <101 IZI 101) + <101 IIZ 101) = -1.
	-<10(1101) =-1

```
We said to the hours of I am it is
   (001 |ZII1 001) + (001 |IZI |001) + (001 |IIZ | 001) = 1.
< ZII + TZI + TIZ> = .0.
    and \langle o_{\overline{z}} \rangle = 1 \sum_{i=1}^{8} p_i (n_i^{\circ} - n_i^{\circ}).
   So for each, need to and night is
|c=|000\rangle \Rightarrow p_{000} = |3|^2 = 9. n_{000} = 3; n_{000} = 0.

2. |001\rangle \Rightarrow p_{001} = (|1|^2 = 1). n_{001} = 2; n_{001} = 1.

3. |010\rangle \Rightarrow p_{010} = |11|^2 = 1. n_{010} = 2. n_{010} = 1.

4. |011\rangle \Rightarrow p_{010} = |-1|^2 = 1. n_{010} = 1; n_{011} = 2.

5. |110\rangle \Rightarrow p_{110} = (-1)^2 = 1. n_{110} = 1; n_{110} = 2.

6. |101\rangle \Rightarrow p_{101} = |-1|^2 = 1. n_{101} = 1; n_{101} = 2.
7. (100) => free = 1112 = 1. Nroo = 2; Nroo = 1.
 8. |111\rangle = > p_{111} = |-3|^2 = 9. n_{111} = 0, n_{111} = 3.
  \langle \sigma_{z} \rangle = \frac{1}{3} \sum_{i=1}^{n} p_{i} (n_{i}^{o} - n_{i}^{i}) = \frac{1}{3} \left[ 9(3-0) + 1(2-1) + \frac{1}{3} \right]
                                                        +1(2-1)+1(1-2)+1(1-2)+
                                                         +1(2-1)+9(0-3)
                            = 1 (9/3 +/ +x -/ -x -/ +x -9/3)= 0.
    The real part of the state of t
               (Soz) = 0. ... The methods are equivalent for
                                                                                                                                                                                                                                       3 gubits.
```

(6)1

(6)

(6)

C

(6)

6

6

67

6

6

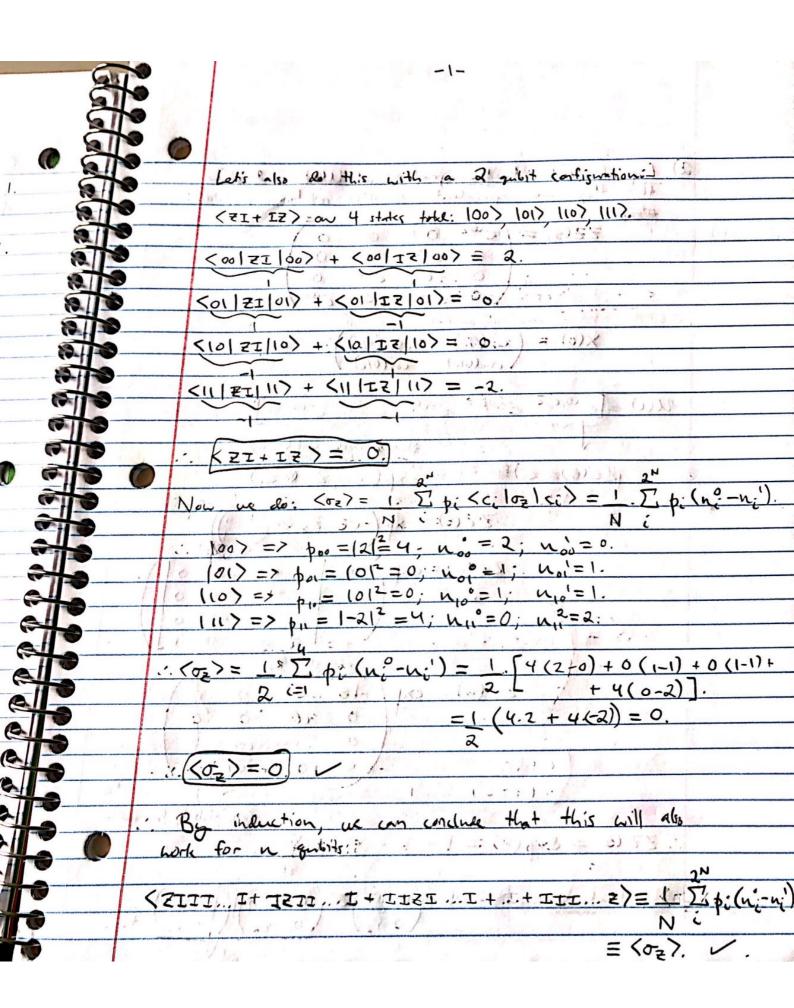
6

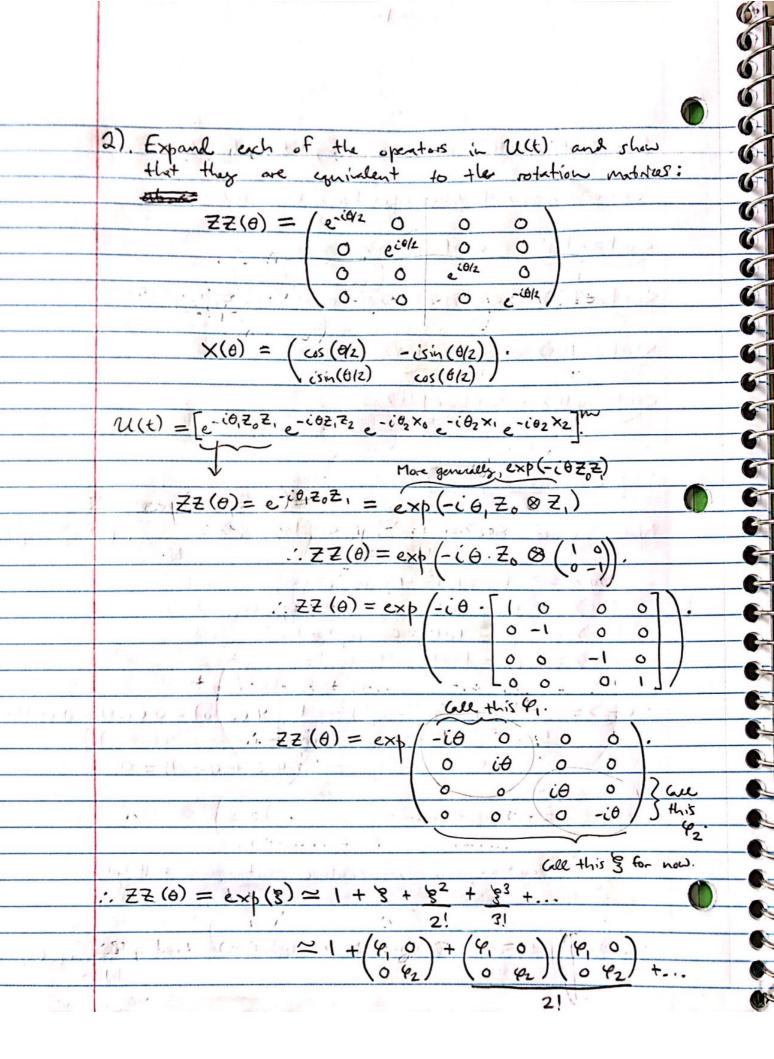
.

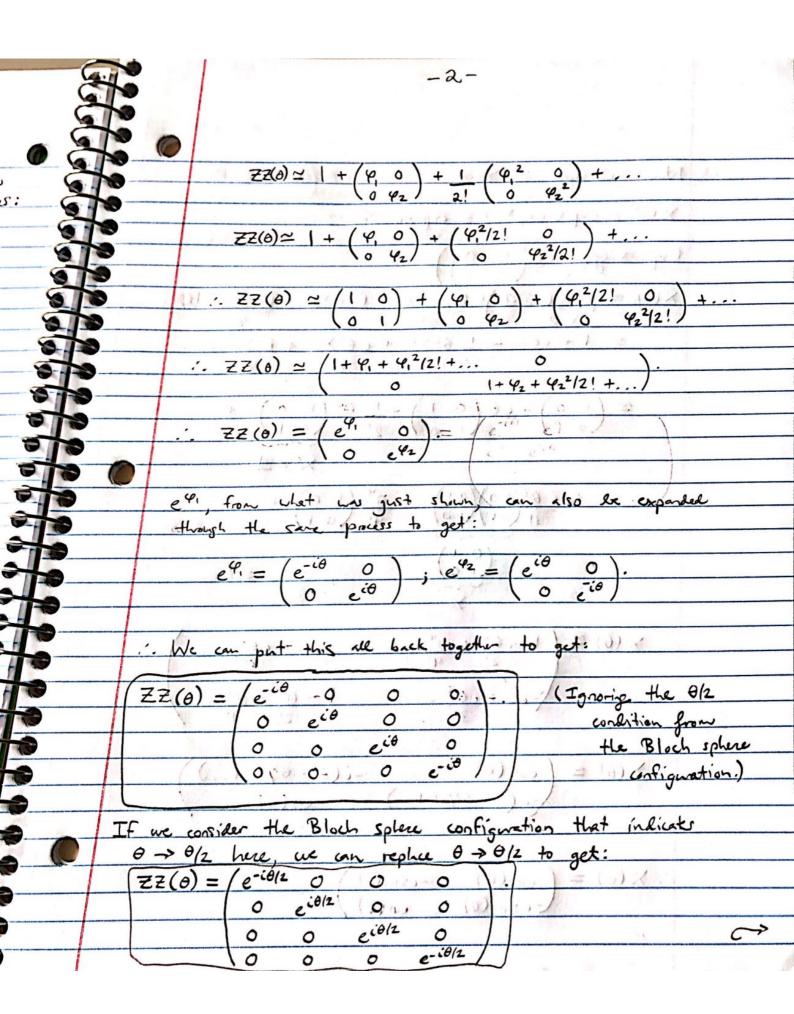
(

(6)

(0)







Now we look at X(0). $\times (\theta) = \exp(-i\theta_2 \times_0) \equiv \exp(-i\theta \times)$ Expanding! $\times (\theta) \simeq 1 + (\iota \theta \times) + (-\iota \theta \times)^2 + (-\iota \theta \times)^3 + (-\iota \theta \times)^4 + \dots$ $\simeq 1 - i\theta \times - \frac{1}{2!} \theta^2 \times^2 + \frac{i\theta^3 \times^2}{3!} + \frac{\theta^4 \times^4}{4!} + \dots$ $\simeq \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} - i\theta \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} - \frac{1}{2!}\theta^2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ $(\theta) \simeq \left(1 - i\frac{\theta^2}{2!} + \frac{\theta^4}{4!} - \dots - i\theta + i\frac{\theta^3}{3!}\right)$ $1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!}$ $-i\theta + i\theta^3 (\cdot, \times(\theta) \simeq \begin{pmatrix} \cos(\theta) & -i(\theta - \theta^3/3! + \ldots) \\ -i(\theta - \theta^3/3! + \ldots) & \cos(\theta) \end{pmatrix}$ $(\cdot, \times(\theta)) = \begin{pmatrix} \cos(\theta) & -i\sin(\theta) \\ -i\sin(\theta) & \cos(\theta) \end{pmatrix}$

6

6

6

6

5

5-

00

0

Including the Block sphere configuration to take 6 - 0/2 here, we get: $-isin(\theta|2)$ $cos(\theta|2)$ $(\omega(\theta|2) - \zeta_{in}(\theta|2)$ $X(\theta) =$