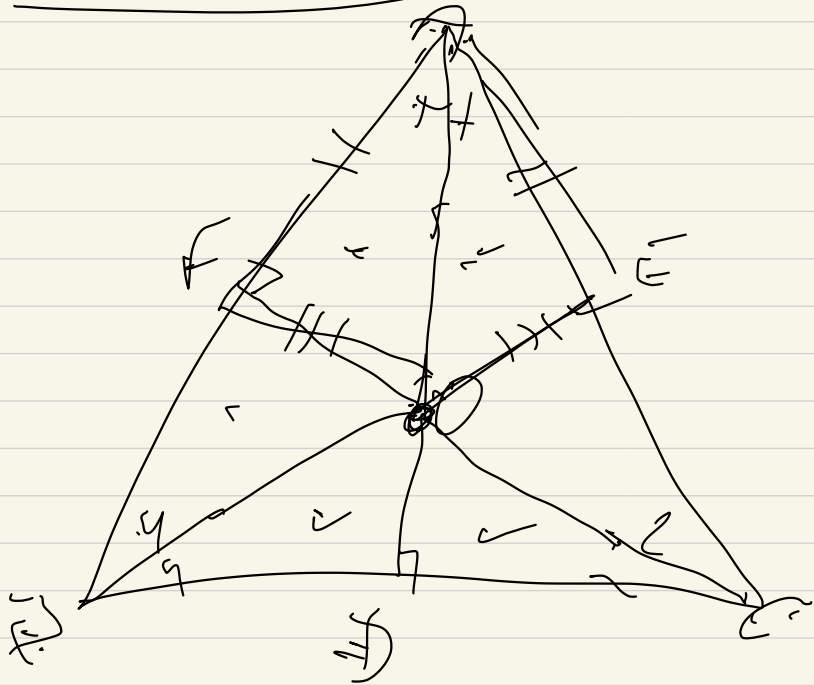
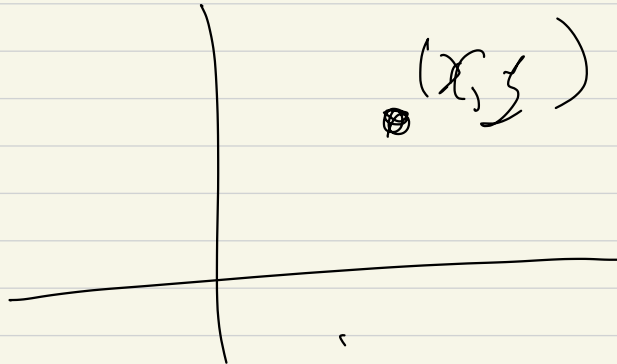


R 9/11 22 C 2



T 32



$$Z = x + iy$$

ROTATE  $(x, y)$  BY  $\theta$ ,  $\theta$

$\equiv$  MULTIPLY  $Z$  BY  $e$

$$90^\circ \text{ ROT} = \frac{\pi}{2}$$

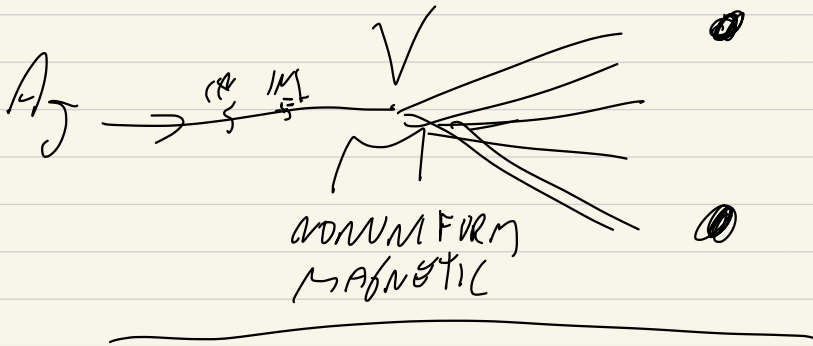
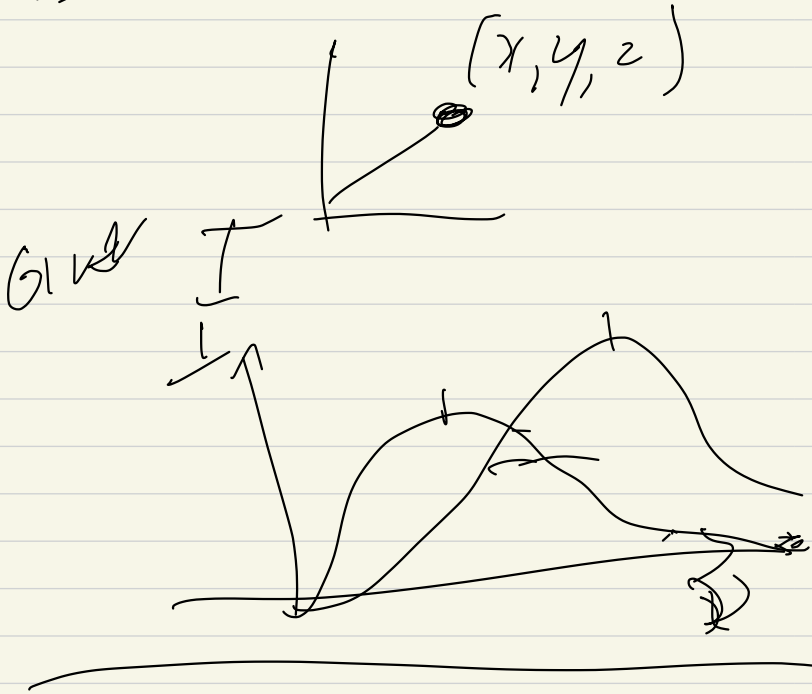
$$\text{MULTI BY } e^{i\frac{\pi}{2}} = i$$



$$4 + 3i$$

$$(4 + 3i)i = -3 + 4i$$

3D



$I \uparrow$

$$\psi = \alpha |0\rangle + \beta |1\rangle$$

$$|\alpha|^2 + |\beta|^2 = 1$$

$$\alpha, \beta \in \mathbb{C}$$

---

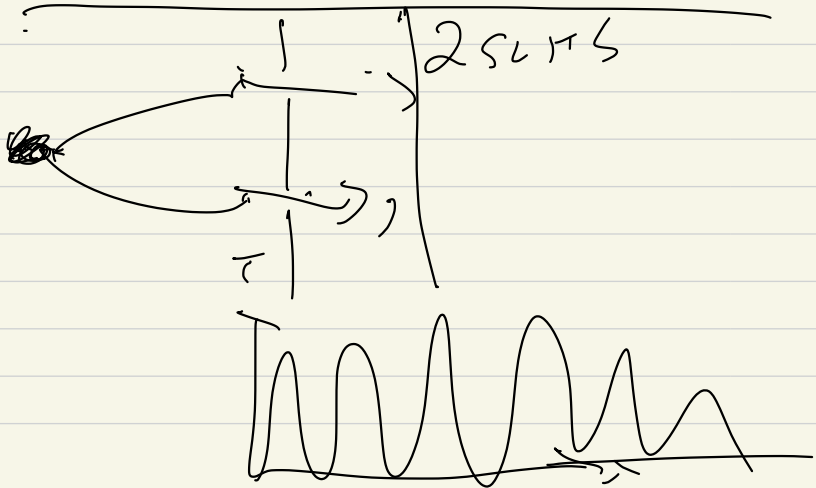
$$\psi = \alpha |0\rangle + \beta |1\rangle$$
$$\alpha^2 + \beta^2 = 1$$

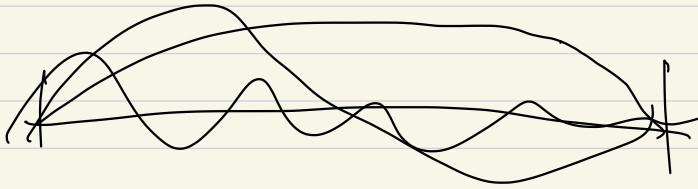
---

$\langle u | v \rangle$  DOT PRODUCT

ACT  $u$  IS A FUNCTION APPLIED TO  $v$ .

---





VIBRANT STRINGS

---

ENTANGLEMENT

2 QBITS  $Q_1$   $Q_2$

MEASURE  $Q_1$  IT COLLAPSES

SO DOES  $Q_2$

$Q_2$  IS 1000 MI AWAY

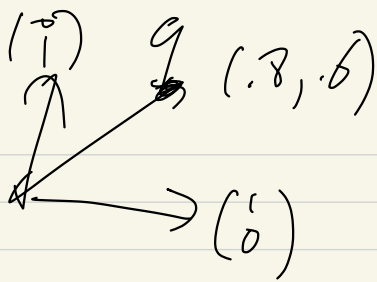
THIS DOES NOT YIELD INFO.

---

MEASUREMENT IS A

PROJECTION ONTO A

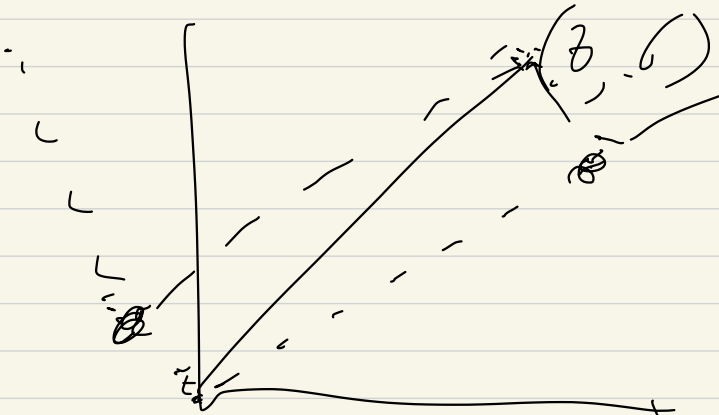
CHOSEN BASIS.



$$q = .8 \begin{pmatrix} 1 \\ 0 \end{pmatrix} + .6 \begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} .8 \\ .6 \end{pmatrix}$$

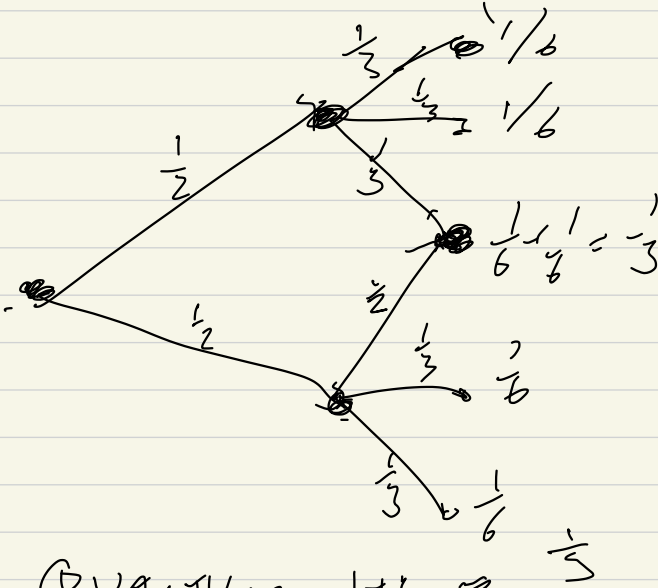
MEASURE  $q$  - 64%  $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$   
 36%  $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$

( YOU CAN CHOOSE A DIFFERENT BASIS TO MEASURE )

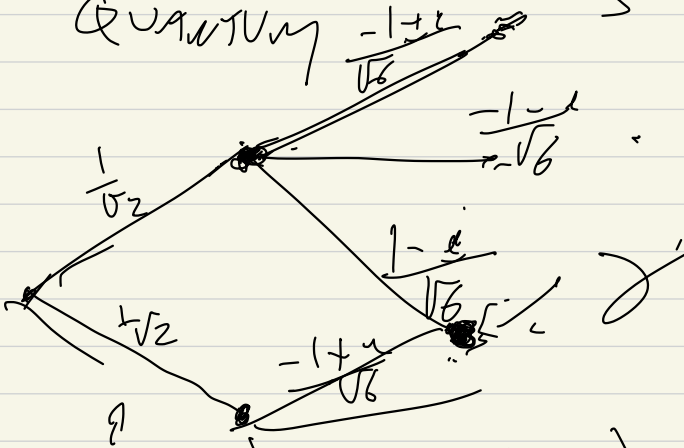


NEW BASIS  $\begin{pmatrix} .7 \\ .5 \end{pmatrix}, \begin{pmatrix} -.7 \\ .7 \end{pmatrix}$

# CLASSICAL 2 SLIT



# QUANTUM

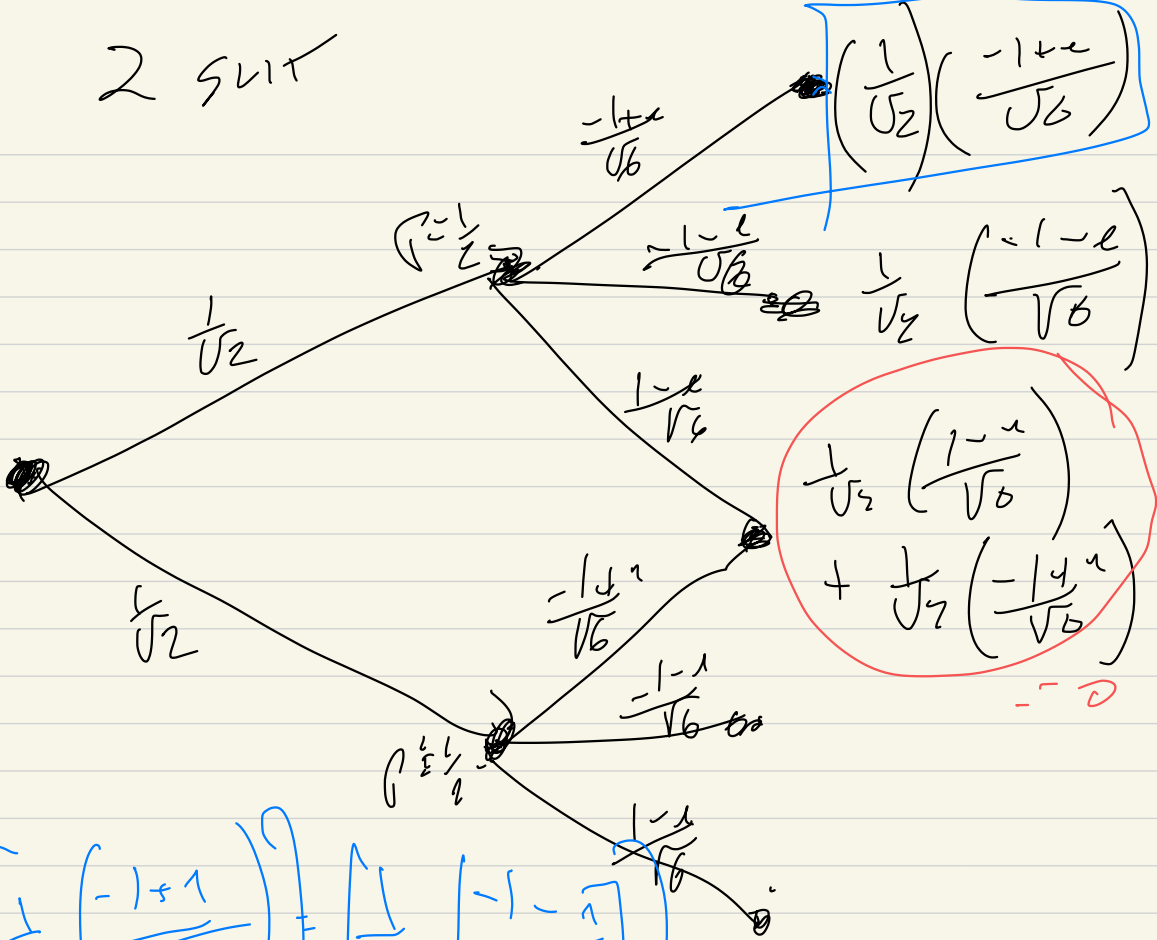


WEIGHINGS

$$\left(\frac{-1-i}{\sqrt{2}}\right)\left(\frac{-1+i}{\sqrt{2}}\right) = \frac{2}{2} = 1$$

$$\psi = \frac{1-i}{\sqrt{2}} + \frac{-1+i}{\sqrt{2}} = 0$$

2 SUIT



$$\frac{1}{\sqrt{2}} \left( \frac{1-u}{\sqrt{6}} \right) + \frac{1}{\sqrt{2}} \left( \frac{-1+u}{\sqrt{6}} \right)$$

$$\left[ \frac{1}{\sqrt{2}} \left( \frac{-1+1}{\sqrt{6}} \right) \right] \left[ \frac{1}{\sqrt{2}} \left( \frac{-1-1}{\sqrt{6}} \right) \right]$$

$$\frac{1}{12} \left( (-1+1)(-1-1) \right) = \frac{1}{12} \left( 0 \cdot -2 \right) = 0$$

(HAVE TO RENORMALIZE)