

$$a) \quad x=|0\rangle, \quad y=|1\rangle, \quad f(x) = x \wedge x \wedge 1$$

$$U_f |0\rangle |1\rangle = |0\rangle |1 \oplus f(x)\rangle$$

$$\Rightarrow |0\rangle |f(x)\rangle$$

$$f(x) = x \wedge x \wedge 1$$

$$\Rightarrow 0$$

$$\overline{f(x)} = 1$$

$$\text{hence } |0\rangle |1\rangle$$

$$b) \quad x=|-\rangle, \quad y=|1\rangle, \quad f(x) = (x \wedge 1) \vee x$$

$$\overline{f(x)} = \overline{(x \wedge 1) \vee x}$$

$$U_f |-\rangle |1\rangle = \frac{1}{\sqrt{2}} U_f |0\rangle |1\rangle - \frac{1}{\sqrt{2}} U_f |1\rangle |1\rangle$$

$$\Rightarrow \left( \frac{(-1)^{f(0)}}{\sqrt{2}} |0\rangle + \frac{(-1)^{f(1)}}{\sqrt{2}} |1\rangle \right) |1\rangle$$

$$f(0) = (0 \wedge 1) \vee 0 = 0$$

$$f(1) = (1 \wedge 1) \vee 1$$

$$= 1$$

$$\Rightarrow \left( \frac{1}{\sqrt{2}} |0\rangle + \frac{1}{\sqrt{2}} |1\rangle \right) |1\rangle$$

$$\Rightarrow \boxed{|+\rangle |1\rangle}$$

2017 OCTOBER						
Mon	30	2	9	16	23	
Tue	31	3	10	17	24	
Wed		4	11	18	25	
Thu		5	12	19	26	
Fri		6	13	20	27	
Sat		7	14	21	28	
Sun	1	8	15	22	29	

$$c) x = |+\rangle, y = |+\rangle$$

$$f(x) = (\overline{x} \vee 0)$$

$$U_f |+\rangle |+\rangle \Rightarrow \left( \frac{f(0)}{\sqrt{2}} |0\rangle + \frac{f(1)}{\sqrt{2}} |1\rangle \right) |+\rangle$$

$$f(0) = 1$$

$$f(1) = 0$$

$$\Rightarrow \left[ \left( \frac{-1}{\sqrt{2}} |0\rangle + \frac{1}{\sqrt{2}} |1\rangle \right) |+\rangle \right]$$

$\phi$