OGL m4 r4 cut it p3

$\overline{AS_{n,c}}(x,y) =$ if (x=0 or y=0){
if (x=n or y=n)
return 6
if (x=n+1 or y=n+1){
return 6
}
} else return 0

$= \overline{S_n} \rightarrow \overline{F_{(+6-1)(-6)}}\ W$ (need to check this one)
$\overline{S_{n+1}} \rightarrow$

$= \overline{F_{(+6-1)(-6)}}(\overline{S_n}, \overline{S_{(n+1)}})$

W is some table, the one that is wanted/needed finally in the end.

$\overline{PCO_2} = \overline{S_2} \rightarrow \overline{F_{0(-1)}}\ W$ (need to check)
$\overline{AS_{12}} \rightarrow$

$= \overline{F_{0(-1)}}(\overline{S_2}, \overline{AS_{12}})$

$U = Z_5$

want

	0	1	2	3	4
0	0	0	0	0	0
1	1	0	0	0	0
2	2	0	0	0	0
3	3	0	0	0	0
4	4	0	0	0	0

A

	0	1	2	3	4
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4

B

	0	1	2	3	4
0	0	1	2	3	4
1	0	1	2	3	4
2	0	1	2	3	4
3	0	1	2	3	4
4	0	1	2	3	4

$\overline{A_1}$ F_{10}

OP

$\overline{(0,1,1)} = \overline{A_0} \rightarrow \overline{F_{10}}$ differs
$\overline{B_1} \rightarrow$

or $\overline{A_0} \rightarrow \overline{F_{20}}$
$\overline{B_1} \rightarrow$

$U = Z_3$

$\overline{(0,1,1)} = \overline{A_0} \rightarrow \overline{F_{00}}$
$\overline{B_1} \rightarrow$

$\overline{AS_{23}} =$

$n-3\ 2-1$

$\overline{S_1} \overline{(0,1,1)} \rightarrow \overline{F_{04}}$
$\overline{(0,0,1)}$

$\overline{S_2 S_3} = \overline{S_2} \rightarrow \overline{(2,2,3)}$

$\overline{4PCO_2} = \overline{AS_{12}} \rightarrow \overline{F_{23}}$
$\overline{IS_{12}} \rightarrow$

$\overline{AS_{12}} = \overline{S_1} \rightarrow \overline{F_{(1)(3)}}$ 02200
$\overline{S_2} \rightarrow$

$\overline{IS_{12}} = \overline{S_1} \rightarrow \overline{(1,1,2)}\ T = \overline{S_1 S_2}$ ..

$\overline{3PCO_2} = \overline{4PCO_2} \rightarrow \overline{F_{22}}$
$\overline{PCO_2} \rightarrow$

$\overline{PCO_2} = \overline{S_2} \rightarrow \overline{F_{04}}$
$\overline{AS_{12}} \rightarrow$

$\overline{ICV_3 P_2 C_3} = \overline{S_2 S_3} \rightarrow \overline{FV_3 P_2 C_3}$
$\overline{AS_{23}} \rightarrow$

need

$\overline{PCO_3} = \overline{3PCO_2} \rightarrow \overline{F_{40}}$
$\overline{ICV_3 P_2 C_3} \rightarrow$

$\overline{A_3 P_{02} C_2} = \overline{A_3} \rightarrow \overline{(0,0,2)}$
$\overline{A_3} \rightarrow$ $\overline{PCO_2}$

$\overline{B_3 P_{02} C_2} = \overline{B_3} \rightarrow \overline{(0,0,2)}$
$\overline{B_3} \rightarrow$ $\overline{PCO_2}$

$\overline{FV_3 P_2 C_3}$

$\overline{A_4 P_2 C_3} = \overline{0} \rightarrow \overline{PCO_2}$
$\overline{A_4} \rightarrow$

$\overline{A_4 P_2 C_3} \rightarrow \overline{F_{22}}$
$\overline{B_4 P_2 C_3} \rightarrow$

$\overline{B_4 P_2 C_3} = \overline{0} \rightarrow \overline{PCO_2}$
$\overline{B_4} \rightarrow$

0GL m4 P5 cont of P4

$V = Z_5$ $\overline{PCO_3} =$

So long as T [illegible] contain 4, I am [illegible]

$(i_1, j_1, V) \to PCO_3 \longrightarrow PCO_3 \longrightarrow PCO_3 \ldots$

$(i_1, j_2, V_2) \quad (i_1, j_3, V_3) \quad (i_2, j_1, V_4)$

$\overline{4PCO_3} : \overline{PCO_3} \to \overline{F_{31}}$

$C:$

$\overline{A_4 P_3 C_4} =$ $\overline{B_4 P_3 C_4} =$

$D = \begin{array}{l} C \to \\ C \to \end{array} \overline{F_{30}}$

$\overline{FV_4 P_3 C_4} = \begin{array}{l} A_4 P_3 C_4 \to \\ B_4 P_3 C_4 \to \end{array}$

$\begin{array}{l} D \longrightarrow \\ 4PCO_3 \to \end{array} \overline{F_{40}}$

OGL m4 P3 cont of P2

$\overline{S_0} = \overline{0}$

$\overline{S_1} : \overline{(0,1,1)} \rightarrow F_{03}$ $\overline{(1,0,1)} \rightarrow$ $\begin{matrix} 0&1&0&0 \\ 1&0&0&0 \\ 0&0&0&0 \\ 0&0&0&0 \end{matrix}$

$\overline{S_2} : \overline{(0,2,2)} \rightarrow F_{12}$ $\overline{(2,0,2)} \rightarrow$ $\begin{matrix} 0&0&2&0 \\ 0&0&0&0 \\ 2&0&0&0 \\ 0&0&0&0 \end{matrix}$

$\overline{S_3} : \overline{(0,3,3)} \rightarrow F_{21}$ $\overline{(3,0,3)} \rightarrow$ $\begin{matrix} 0&0&0&3 \\ 0&0&0&0 \\ 0&0&0&0 \\ 3&0&0&0 \end{matrix}$

$\overline{S_1} \rightarrow F_{12}$ $\overline{S_2} \rightarrow$ $\begin{matrix} 0&2&2&0 \\ 2&0&0&0 \\ 2&0&0&0 \\ 0&0&0&0 \end{matrix} : \overline{AS_{12}}$

$\overline{S_1} \rightarrow \overline{(1,1,2)}$ $\overline{S_1} \rightarrow$ $\overline{IS_{12}}$ $\begin{matrix} 0&2&0&0 \\ 2&0&0&0 \\ 0&0&0&0 \\ 0&0&0&0 \end{matrix}$ $\overline{AS_{12}} \rightarrow F_{22}$ H $\begin{matrix} 3&1&2&3 \\ 1&3&3&3 \\ 2&3&3&3 \\ 3&3&3&3 \end{matrix}$

$\overline{S_2} \rightarrow F_{03}$ $\overline{AS_{12}} \rightarrow$ D $\begin{matrix} 0&1&2&0 \\ 1&0&0&0 \\ 2&0&0&0 \\ 0&0&0&0 \end{matrix}$

$\overline{S_2} \rightarrow F_{21}$ $\overline{S_3} \rightarrow$ $\overline{AS_{23}}$ $\begin{matrix} 0&0&3&3 \\ 0&0&0&0 \\ 3&0&0&0 \\ 3&0&0&0 \end{matrix}$

$\overline{S_3} \rightarrow F_{12}$ $\overline{AS_{23}} \rightarrow$ C $\begin{matrix} 0&0&2&3 \\ 0&0&0&0 \\ 2&0&0&0 \\ 3&0&0&0 \end{matrix}$

$\overline{I} \rightarrow F_{30}$ $\overline{H} \rightarrow$ $\begin{matrix} 0&1&2&3 \\ 1&0&0&0 \\ 2&0&0&0 \\ 3&0&0&0 \end{matrix}$

yay!, not quite sure about symmetric way though

$\overline{S_2} \rightarrow \overline{(3,2,3)}$ $\overline{S_2} \rightarrow$ $\begin{matrix} 0&0&3&0 \\ 0&0&0&0 \\ 3&0&0&0 \\ 0&0&0&0 \end{matrix}$ $\overline{AS_{23}} \rightarrow$ G I $\begin{matrix} 1&1&2&3 \\ 1&1&1&1 \\ 2&1&1&1 \\ 3&1&1&1 \end{matrix}$

unused
$\begin{matrix} 1&x&x&3 \\ x&x&x&x \\ x&x&x&x \\ 3&x&x&2 \end{matrix}$

$\overline{F_{nb}}(x,y) = \text{if}(x=y)$
return $(x-1-n-b)$
else
return $(-b)$

$\overline{A_3} \rightarrow \overline{(4,4,2)}$ $\overline{A_3} \rightarrow$ $\begin{matrix} 0&0&0&0 \\ 0&0&0&0 \\ 0&0&0&0 \\ 2&2&2&2 \end{matrix}$ $\overline{A_3} \rightarrow$ D E $\begin{matrix} 1&1&1&1 \\ 2&2&2&2 \\ 0&0&0&0 \\ 2&2&2&2 \end{matrix}$

$\overline{F_{n0}}(x,y) = \text{or}(\overline{A_n}, \overline{B_n})$

$\overline{F_{nb}}(x,y) = \text{or}(\overline{F_{n(b-1)}}, \overline{F_{n(b-1)}})$

$\overline{B_3} \rightarrow \overline{(0,0,2)}$ $\overline{B_3} \rightarrow$ $\begin{matrix} 0&0&0&2 \\ 0&0&0&2 \\ 0&0&0&2 \\ 0&0&0&2 \end{matrix}$ $\overline{B_3} \rightarrow$ P F $\begin{matrix} 1&2&0&2 \\ 1&2&0&2 \\ 1&2&0&2 \\ 1&2&0&2 \end{matrix}$

$\overline{S_n} = \overline{(0,n,n)} \rightarrow \overline{F_{(n-1)(n-n)}}$ $\overline{(n,0,n)} \rightarrow$

$= \overline{F_{(n-1)(n-n)}}(\overline{(0,n,n)}, \overline{(n,0,n)})$

$\overline{E} \rightarrow F_{21}$ $\overline{F} \rightarrow$ G $\begin{matrix} 1&3&3&3 \\ 3&2&3&2 \\ 3&3&0&3 \\ 3&2&3&2 \end{matrix}$

$\overline{S_n}(x,y) = \text{if}(x=n \;||\; y=n)$
return n
else
return 0

$\overline{PCO_n}(x,y) =$ $\begin{matrix} 0&1&2&\cdots&n&0&\cdots&0 \\ 1&0&0&0&&0&& \\ 2&0&0&0&&&& \\ \vdots&&&&&&& \\ 0&0&&&&&&0 \end{matrix}$

$\overline{PCO_0} = \overline{0}$

$\overline{PCO_1} = \overline{S_1}$

cont on m4 P4

OGL m3 P6 passes 3

want pass

0	0	0
1	0	0
2	0	0

UP	0	1	2
0	2	0	0
1	0	0	0
2	0	0	1

$\bar{A}$: 000 / 111 / 222

$\bar{B}$: 012 / 012 / 012

OR	0	1	2
0	0	1	2
1	1	1	2
2	2	2	2

$V_1 \to$ ⓪ $= V_3(V_1, V_2)$
$V_2 \to$

$\bar{A} \to$ 222 / 000 / 111 $\Rightarrow$ C 111 / 222 / 000

$\bar{A} \to$, $\bar{B} \to$ F 200 / 000 / 001 $\Rightarrow$ P 122 / 222 / 220 $\to$ 011 / 111 / 112

$P(C,F) = $ H 222 / 022 / 212

$\bar{B} \to$ F 201 / 201 / 201 $\Rightarrow$ 120 / 120 / 120

E $\to$ 000 / 000, C $\to$ 000 / 000; C $\to$ 220 $\to$ 002

C $\to$ I 000 / 100; E $\to$ 020

$\bar{B} \to$ G 000 / 001; C $\to$ 200

(A, C)

$\bar{B} \to$, $\bar{B} \to$ Ⓐ 012 / 012 / 012

$\bar{A}_0 \to$ $\bar{A}_1$: 222 / 000 / 111 $\to$ $\bar{A}_2$: 111 / 222 / 000

F $\to$, G $\to$ OR 000 / 101 / 220

$\bar{B}_0 \to$ $\bar{B}_1$: 201 / 201 / 201 $\to$ $\bar{B}_2$: 120 / 120 / 120

OR	0	1	2
0	0	1	2
1	1	1	2
2	2	2	2

UP	0	1	2
0	2	0	0
1	0	0	0
2	0	0	1

$\bar{A}_0$	0	1	2
	0	0	0
	1	1	1
	2	2	2

$\bar{B}_0$	0	1	2
0	0	1	2
1	0	1	2
2	0	1	2

M4 Isolate and OR
P0

	$\bar{0}$	$\bar{2}$	$\bar{1}$
$\bar{A}_0$	000 / 000	222 / 222	111 / 111
$\bar{A}_1$	000	222	111

w want	0	1	2
0	2	2	1
1	0	1	0
2	0	2	1

$0\overset{0}{2}$: $\bar{A}_0 \to$ 200 / 000, $\bar{B}_0 \to$ 001 $\xrightarrow{\bar{2}}$ 100 / 000 / 000 $\to$ 022 / 222 / 222 $\xrightarrow{\bar{0}}$ 200 / 000 / 000 w_{00}

$0\overset{01}{02}$: $\bar{A}_0$, $\bar{B}_1 \to$ 020 / 000 / 100 $\xrightarrow{\bar{2}}$ 010 / 000 / 000 $\to$ 202 / 222 / 222 $\xrightarrow{\bar{0}}$ 020 / 000 / 000 w_{01}

$0\overset{2}{1}$: $\bar{A}_0 \to$, $\bar{B}_2 \to$ 002 / 000 / 010 $\xrightarrow{\bar{2}}$ 001 / 000 / 000 w_{02}

10: $\bar{0}$ $\quad$ 11: $\bar{A}_1 \to$, $\bar{B}_1 \to$ 100 / 020 / 000 $\xrightarrow{\bar{2}}$ 000 / 010 / 000 w_{11}

22: $\bar{A}_2 \to$, $\bar{B}_1 \to$ 000 / 100 / 020 $\xrightarrow{\bar{2}}$ 000 / 000 / 010 $\to$ 222 / 222 / 202 $\xrightarrow{\bar{0}}$ 000 / 000 / 020 w_{21}

21: $\bar{A}_2 \to$, $\bar{B}_2 \to$ 000 / 010 / 002 $\xrightarrow{\bar{2}}$ 000 / 000 / 001 w_{22}

w_{00} w_{01} OR 220 / 000 / 000 $\to$ w_{02} OR 221 / 000 / 000 $\to$ w_{11} OR 221 / 010 / 000 $\to$ w_{21} OR 221 / 010 / 020 $\to$ OR w_{22} 221 / 010 / 021 dGL m3 r5

want

0 1 2
1 1 2
2 2 2

$*_1 = \{0,1,2\}$

$\bar{*}_1 = \{x : x \notin *_1 \cap \{1\}\}$

want

0 1
1 1

ignoring, after pattern

$op_4 \to OR_4$

want

0 1 2 3
1 1 2 3
2 2 2 3
3 3 3 3

$or(*, \bar{*}) = 0$

Yay!

$OR(A,B) = OPC(\,orc(C, OPC(orc(D,E), orc(D,E))\,))$

$OPC(OPC(orc(\bar{A},\bar{B}), OPC$ $C = orc(\bar{A},\bar{B})$

$D = orc(C,C)$

$M = orc(OPC(C, L), orc(C, G))$

$L = orc(orc(\bar{B},\bar{B}), or(\bar{B},\bar{B}))$

$G = orc(orc(\bar{A},\bar{A}), orc(\bar{A},\bar{A}))$

OGL m3 P2

Thm 1 scratch for $U = \{0, 1, 2\}$

want $= f$

A \ B	0	1	2
0	a_{00}	a_{01}	a_{02}
1	a_{10}	a_{11}	a_{12}
2	a_{20}	a_{12}	a_{22}

$g_\alpha(\{0,1,2\}) = \{a_{\alpha 0}, a_{\alpha 1}, a_{\alpha 2}\}$, $\alpha \in U$

$$\bar{A} = \begin{matrix} 0 & 0 & 0 \\ 1 & 1 & 1 \\ 2 & 2 & 2 \end{matrix} \qquad \bar{B} = \begin{matrix} 0 & 1 & 2 \\ 0 & 1 & 2 \\ 0 & 1 & 2 \end{matrix}$$

g_0: 0 1 2 → a_{00} a_{01} a_{02} $\downarrow B$ $Pass_0$

g_1: 0 1 2 → a_{10} a_{11} a_{12} $\downarrow B$ $Pass_1$

g_2: 0 1 2 → a_{20} a_{21} a_{22} $\downarrow B$ $Pass_2$

$\bar{A} \to A$:

A \ B			
0	a_{00}	a_{01}	a_{02}
1	0	0	0
2	0	0	0

$\bar{A} \to A$:

0	0	0
a_{10}	a_{11}	a_{12}
0	0	0

$\bar{A} \to A$:

0	0	0
0	0	0
a_{20}	a_{21}	a_{22}

$\downarrow B$ OR → A

a_{00}	a_{01}	a_{02}
a_{10}	a_{11}	a_{12}
0	0	0

$\downarrow B$ OR

a_{00}	a_{01}	a_{02}
a_{10}	a_{11}	a_{12}
a_{20}	a_{21}	a_{22}

$$f(A,B) = OR(OR(Pass_0(\bar{A}_{(A,B)}, g_0(B)), Pass_1(\bar{A}_{A}(A,B), g_1(B))), Pass_2(\bar{A}_{A}(A,B), g_2(B)))$$

Thm ~~1~~ $1\frac{1}{2}$ =

for every $f: U \to U$, f can be expressed as a compos[ition of] OR, pass and any function $g: \varnothing \to U$. // maybe not

want $= f$

A	0	1	2
	a_0	a_1	a_2

$g_\alpha() = a_\alpha$

~~OR(U) 0 1 2~~

$OR(\{0,1,2\}) = $ ~~{0,1,2} ...~~

$OR(U) =$

	0	1	2
0	0	1	2
1	1	1	2
2	2	2	2

$Pass_1(U) =$

	0	1	2
0	U	0	0
1	U	1	0
2	U	0	0

$Pass_2(U) =$ if $(2 = U)$ return U else 0

$g_0 \downarrow Pass_0$, $g_1 \downarrow Pass_1$, $g_2 \downarrow Pass_2$

a_0	0	0	a_1	0	0	0	a_2
a_0	0	0	a_1	0	0	0	a_2
a_0	0	0	a_1	0	0	0	a_2

$\downarrow A$ $\downarrow B$ OR

a_0	a_1	0
a_0	a_1	0
a_0	a_1	0

$\to A$ $\downarrow B$ OR

a_0	a_1	a_2
a_0	a_1	a_2
a_0	a_1	a_2

$= h(q, D)$ $f(A) = h(q, A)$

One gate logic   OGL   m2p4

OP_3

$A \backslash B$	0	1	2
0	2	0	0
1	0	0	0
2	0	0	1

→ get to

f

$A \backslash B$	0	1	2
0	1	0	*
1	0	0	*
2	*	*	*

where * is any number

A: 0 1 2

2	2	2

B: 0 1 2

0	1	2
0	1	2
0	1	2

Implied OP_3

C_1

2	0	0
0	0	0
0	0	1

C_2

1	2	2
2	2	2
2	2	0

C_3

0	0	0
0	0	0
0	0	0

C_4

2	2	2
2	2	2
2	2	2

1_A

0	2	2
0	0	0
0	0	0

1_B

2	0	1
2	0	0
0	0	0

C_5 got it

1	0	0
0	0	0
0	0	0

$$C_5(A,B) = OP_3(C_1, C_4) = OP_3(OP_3(A,B), OP_3(C_3, C_3))$$

on M1 P3 OGL

Same goal

2	0	0	X
0	0	0	X
0	0	1	X
X	X	X	X

OP_4

$A \backslash B$	0	1	2	3
0	3	0	0	0
1	0	0	0	0
2	0	0	1	0
3	0	0	0	2

A =

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3

B =

0	1	2	3
0	1	2	3
0	1	2	3
0	1	2	3

C_1

3	0	0	0
0	0	0	0
0	0	1	0
0	0	0	2

C_2

2	3	3	3
3	3	3	3
3	3	0	3
3	3	3	1

C_3

0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

C_4

3	3	3	3
3	3	3	3
3	3	3	3
3	3	3	3

C_7

1	2	2	2
2	2	2	2
2	2	3	2
2	2	2	0

C_6

1	0	0	0
0	0	0	0
0	0	3	0
0	0	0	0

C_5

2	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

OGL m3 p1

OP_3

$A \backslash B$	0	1	2
0	2	0	0
1	0	0	0
2	0	0	1

$flip_1$

A	
0	2
1	1
2	0

$flip_2$

A	
0	1
1	0
2	2

$flip_0$

A	
0	0
1	2
2	1

rot_+

0	1
1	2
2	0

rot_-

0	2
1	0
2	1

plus

0	1
1	2
2	2

min

0	0
1	0
2	1

OR

$A \backslash B$	0	1	2
0	0	1	2
1	1	1	2
2	2	2	2

$Pass_0$

$A \backslash B$	0	1	2
0	0	1	2
1	0	0	0
2	0	0	0

$Pass_1$

$A \backslash B$	0	1	2
0	0	0	0
1	0	1	2
2	0	0	0

$Pass_2$

$A \backslash B$	0	1	2
0	0	0	0
1	0	0	0
2	0	1	2

~~thm: F~~ thm 1: Let $U = \{x \in \mathbb{Z} : 0 \le x \le a\}$, $a \in \mathbb{Z}$. For every function $f : U \times U \to U$, f can be expressed as a compound composition of OR, $Pass_b$, $b \in U$, and any function $g : U \to U$. // need to include $\bar{A}$, $\bar{B}$

thm 2: Let $U = \{x \in \mathbb{Z} : 0 \le x \le a\}$, $a \in \mathbb{Z}$. For every function $f : U \times U \to U$, f can be expressed as a compound composition of OP_a, where $OP_a : U \times U \to U$, and

$OP_a(b, c) =$ if $(b = c)$

return $(b - d) \bmod (a)$, $d \in (U - \{0\})$ // ~~d and a must be rel prime~~

else

return e, $e \in U$

where d and e do not change.

One gate logic OGL m1 p1

extension of binary logic

2 ary.

Nand

A	B	
1	1	0
1	0	1
0	1	1
0	0	1

NoR

A	B	
1	1	0
1	0	0
0	1	0
0	0	1

Nand

$A \backslash B$	0	1
0	1	1
1	1	0

Nor

$A \backslash B$	0	1
0	1	0
1	0	0

$A \land B$

$\neg A \lor \neg B$

$A \lor B$

$\neg A \land \neg B$

$Nand(A,A) \not\equiv A$

$Nor(A,A) \not\equiv A$

$(Nand(A,B) \not\equiv A) \land (Nand(A,B) \not\equiv B)$

$(Nor(A,B) \not\equiv A) \land (Nor(A,B) \not\equiv B)$

op1

$A \backslash B$	0	1	2
0	2	0	0
1	0	0	0
2	0	0	1

get +1

A	
0	2
1	1
2	2

0 1 2 → op1(A,A) → 2 0 0

A \ A	op1
1	2 2

$A \backslash B$	0	1
0	0	1

$A \backslash B$	0	1
0	2	0

A \ B	op1
	2 1 2

op1(op1 (op1(A,A), op1(A,A)), A)

Trinary logic

1 input

cmt	
i	0

flip$_1$

0	2
1	1
2	0

flip0

2	0
0	0
1	2
0	0
1	2
2	1

flip$_2$

1	0
2	2
0	1
0	1
1	0
2	2

rot$_+$

0	1
1	2
2	0

rot$_-$

0	2
1	0
2	1

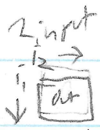
plus

0	1
1	2
2	2

minus

0	0
1	0
2	1

2 input



EQ (equal)

	0	1	2
0	2	0	0
1	0	2	0
2	0	0	2

add

	0	1	2
0	0	1	2
1	1	2	0
2	2	0	1

abSub (absolute value of substract)

	0	1	2
0	0	1	2
1	1	0	1
2	2	1	0

aCKCry ((Check add carry)

	0	1	2
0	0	0	0
1	0	0	2
2	0	2	2

mul (multiply)

	0	1	2
0	0	0	0
1	0	1	2
2	0	2	1

Hand (Hyper and)

	0	1	2
0	0	0	0
1	0	0	0
2	0	0	2

and

	0	1	2
0	0	0	0
1	0	1	0
2	0	0	2

OR

	0	1	2
0	0	1	2
1	1	1	2
2	2	2	2

XOR

	0	1	2
0	0	1	2
1	1	0	2
2	2	2	0

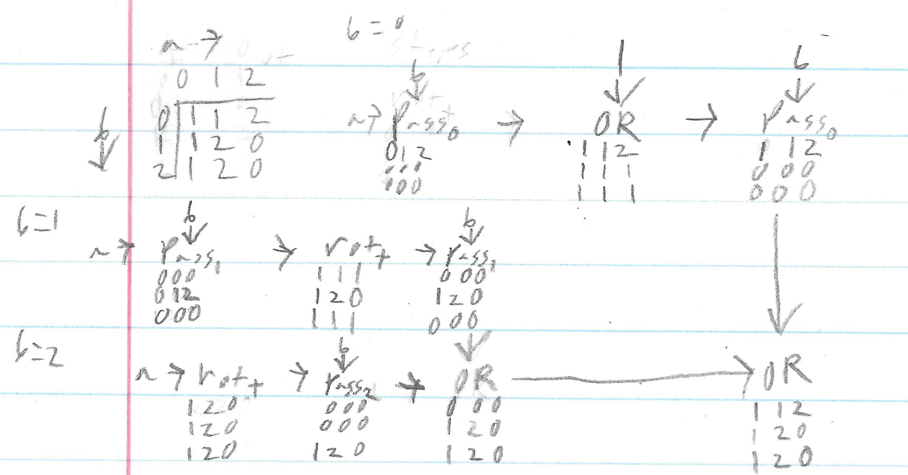
2test

	0	1	2
0	0	0	0
1	0	0	1
2	0	1	2

Pass$_2$ (needs better name)

	0	1	2
0	0	0	0
1	0	0	0
2	0	1	2

testing trinary logic



ternary

flip$_0$	
0	0
1	2
2	1

flip$_1$	
0	2
1	1
2	0

flip$_2$	
0	1
1	0
2	2

rot$_+$	
0	1
1	2
2	0

rot$_-$	
0	2
1	0
2	1

plus	
0	1
1	2
2	2

min	
0	0
1	0
2	1

OR

	0	1	2
0	0	1	2
1	1	1	2
2	2	2	2

pass$_0$

	0	1	2
0	0	1	2
1	0	0	0
2	0	0	0

ex: $a \to$, $b \downarrow$

	0	1	2
0	2	2	1
1	0	1	0
2	0	2	1

$a \to$ flip$_1$ $\to$ plus $\to$ pass$_0$ (b)
210 221 221 / 000 / 000

$a \to$ flip$_0$ $\to$ min $\to$ pass$_1$ (b)
021 010 000 / 010 / 000

$a \to$ flip$_0$ $\to$ pass$_2$ (b)
021 000 / 000 / 021

$\to$ OR
221 / 010 / 000

OR
221 / 010 / 021

3	1	0	2
0	2	1	3
1	3	2	0
2	0	3	1

4-ary

flip$_0$	
0	0
1	2
2	3
3	1

flip$_1$	
0	2
1	1
2	3
3	0

flip$_2$	
0	3
1	1
2	2
3	0

rot$_+$	
0	1
1	2
2	3
3	0

rot$_-$	
0	3
1	0
2	1
3	2

plus	
0	1
1	2
2	3
3	3

min	
0	0
1	0
2	1
3	2

inv	
0	3
1	2
2	1
3	0

pass$_0$

	0	1	2	3
0	0	1	2	3
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0

OR

	0	1	2	3
0	0	1	2	3
1	1	1	2	3
2	2	2	2	3
3	3	3	3	3

ex: $a \to$, $b \downarrow$

	0	1	2	3
0	3	1	2	3
1	1	1	2	0
2	0	1	0	0
3	2	3	2	1

$a \to$ rot$_-$ $\to$ plus $\to$ pass$_0$ (b)
3012 3123 3123 / 0000 / 0000 / 0000

$a \to$

$$\frac{d^a f(x)}{dx^a} <= \wedge \frac{d^b f(x)}{dx^b} <= \frac{d^c f(x)}{dx^c} \quad ||$$

$$\frac{d^a f(x)}{dx^a} >= \wedge \frac{d^b f(x)}{dx^b} >= \frac{d^c f(x)}{dx^c}$$

2. **(10 points)**

Find an equation of the plane passing through the point (1,2,3) and parallel to the directions $\vec{v} = \langle 2, -3, 0\rangle$ and $\vec{w} = \langle 2, 1, 1\rangle$.

$\langle -3,-4,8\rangle = v \times w = \begin{vmatrix} \langle 1,0,0\rangle & 010 & 001 \\ 2 & -3 & 0 \\ 2 & 1 & 1 \end{vmatrix} = \langle -3-0, -(2), 2--6\rangle$ (red marginal mark: -1)

$= \langle \cancel{-4}^{-3}, -2, 8\rangle$

$L(x,y,z) = \langle -4,-2,8\rangle \cdot \langle a-1, b-2, c-3\rangle$

$0 = -4(x-1) + -2(y-2) + 8(z-3)$

↑ we usually express plane using x,y,z variables not a,b,c.

unrelated:

$T_{f(x)}(x) = \sum_{n=0}^{\infty} \frac{f^{n}(0)\cdot x^n}{n!}$

$f(x,y) = x^4 + y^4$

$T_{f(x,y)}(x,y) = \frac{\langle 4x^3, 4y^3\rangle \cdot (\langle x,y\rangle)^0}{0!} + \frac{\langle\langle 12x^2, 0\rangle, \langle 0, 12y^2\rangle\rangle \cdot (\langle x,y\rangle)}{1!} + \ldots$

list L

$T_{f(x,y)}(\langle x,y\rangle) = \sum_{n=0}^{\infty} \frac{D \ldots D f(0) \cdot L^2}{n!}$

~~f(x)=~~

$f(x,y) = e^{xy}$

$T_{f(x,y)}(x,y) = \frac{\langle y e^{xy}, x e^{xy}\rangle \cdot (\langle x,y\rangle)^{n}}{0!} + \langle\langle y^2 e^{xy}, x e^{xy}\rangle, \langle$

$+ \langle\langle y e^{xy}, y, y +$

$f(x,y) = x + y$

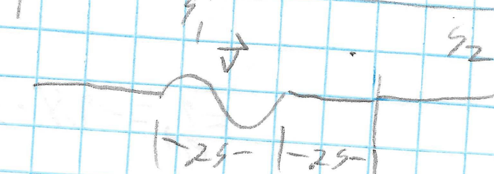
$T_{f(x,y)}(x,y) = \frac{\langle x+y, x+y\rangle \cdot \langle x,y\rangle^0}{0!} + \frac{\langle 1,1\rangle \cdot \langle x,y\rangle^1}{1!}$

$= x + y$

$\langle\langle 12x^2, 0\rangle, \langle 0, 12y^2\rangle\rangle \cdot \langle x,y\rangle = \langle 12x^2, 0\rangle \cdot \langle x,y\rangle + \langle 0, 12y^2\rangle \cdot \langle x,y\rangle$

$= 12x^3 + 0 + 0 + 12y^3$

Sec 001-2442 | or 28 | Cressy, David 6

2) 

$C_1 = .5\frac{m}{s}$ $\lambda_1 = .25m$ $C = \lambda f$

$\lambda_2 = .5m$

$f_1 = f_f$ $f_1 = f_2$

a) $\frac{C}{\lambda} = f$ $f = \frac{.5}{.25} = 2\frac{1}{s}$

$T = \frac{1}{2}s$

c) $\frac{\lambda_1 \cancel{f_1}}{C_1} = \frac{\lambda_2 \cancel{f_2}}{C_2}$

$\frac{.25m}{+.5\frac{m}{s}} = \frac{.5m}{C_2}$ $C_2 = +1\frac{m}{s}$

$C_{1,f} = -.5\frac{m}{s}$

d) $W_1 - \Delta x = .25m + .75m$
$= 1m$
$C_1 = .5\frac{m}{s}$ $\frac{1m}{.5\frac{m}{s}} = 2s$
$2s$

a) Period is only related to frequency, which is only related to the source, ∴ $f_1 = f_2$

b) $C = \sqrt{\frac{T}{\mu}}$ $\mu = \frac{mass}{length\ unit}$

$T = tension$

$T_1 = T_2$ = they are connected

$C^2 \mu = T$

$C_1^2 \mu_1 = C_2^2 \mu_2$

$\frac{(.5\frac{m}{s})^2}{(1\frac{m}{s})^2} = \frac{\mu_2}{\mu_1}$

$.25 = \frac{\mu_2}{\mu_1}$

∴ String 1 is 4x more dense than String 1

$\cancel{C^2 = m}$ L = x
wave / has acceleration ?

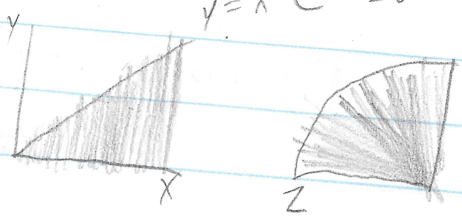
$C^2 \cdot \frac{m}{L} = F^T$

$C^2 \cdot m = F \cdot L$

$C^2 \cdot m = E$

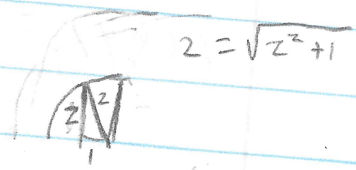
Cone

$y = x$ @ $z = 0$

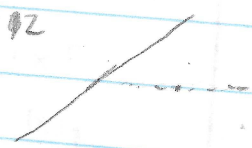


$a^2 + b^2 = c^2$

$2 = \sqrt{z^2+1}$



$x = 1$, $y = 2$



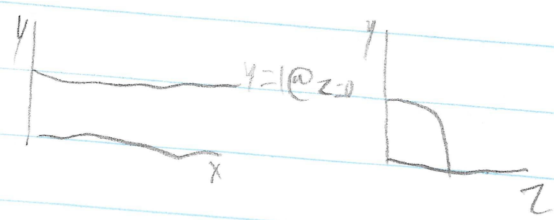
$Z =$

$y = \sqrt{z^2 + x^2}$

$z^2 = y^2 - x^2$

$z = \pm\sqrt{y^2 - x^2}$

Cylinder



$Z =$

$\cancel{1 = \sqrt{x^2+y^2}}$

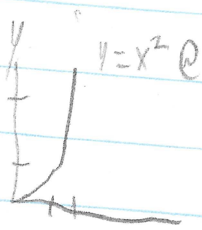
$\cancel{1 = \sqrt{y^2+z^2}}$

$z = \pm\sqrt{y^2 - 1^2}$

$\cancel{-z = y^2 - 1}$ $\quad 0 = \pm\sqrt{y^2 - 1^2}$

$\cancel{z^2 = y^2 + 1}$ $\quad y^2 = 1^2$

$\cancel{z = \pm\sqrt{1+y^2}}$ $\quad y = 1$



$z = \pm\sqrt{y^2 - (x^2)^2}$

$0 = \sqrt{y^2 - x^4}$

$\cancel{-y^2 = -x^4}$

$f(x)$ to $f(x,y)$

$f(x,y) = \pm\sqrt{y^2 - f(x)^2}$

$\pi \int f(x)^2\, dx = \int f(x,y)$?

this is bad becuase it is "our own intelligence that ~~[will]~~ flattens into artificial intelligence." smart aruges that our view of intellegence is shifting from being able to do computations in ones head to being able to use tool of technology to be free to create new things.

conc:

technology changes the way we think, for the bad and for the better. It will make us think less deely, while also freeing us to be more creative.

[illegible]

main umbrella: technology is shaping the way we think
google point: technology is making us lose the ability to think deeply by giviing us information in small chunks
smarter point: technology will free us to think more creativly and give the machine the machiny parts

ways they address their point;
looking to the past
goog:
anology to hal
last sent:
as we come to rely on computers to mediate our understanding of the world, it is our own int that flattens into artificial int.
smart:
last sent:
So yes, when we're augmenting ourselves, we can be smarter. We're becoming centaurs. But our digital tools can also leave us smarter even when we're not actively using them.
direct counter to "not think how I used to" paragraph(30)
the publishing ind

original thought:
smart:
extended mind (347)

spell check

intro:
(hooking statement). ~~While it is known true that~~ technology is shaping the way we think, however there is discorce over whether this shaping is good or not. "Is google making us stupid?" (goog), by Nicholas Carr, and "Smarter than You Think: how technology is changing our minds ofr the better 'chapt 1 rise of the centaurs!" (smart), by Clive Thompson give diverent viewports into this topic (how do they diverging?). goog main viewpoint is that technology frees us to think creativly. smart gives the view that technology is by giving us information so easily, it is making us lose the ability to think deeply. These essay offer insight by looking to the past, how we are reading, and how our intelegence is changing.
body:
In the past:
by looking back to the past, we see that new technologys change how we think. Socrates is quoted as saying that the invention of writing will cause forgettfullness. smart expounds upon the fact that socrates failed to see that "the types of complex thought that would be possible once you no longer needed to mentally store everything you'd encountered" (smarter par19). This leads him to belive that the creation of this information machine will cause an explosion greater than that of the creation of writing. goog argues that the invintion of writing did indead create many of the problems socrates thought would happen, but for the most part is benificial. However, the internet is a diffent beast because of the fact that it aims to make the user spend as little time on one place so that it can get the most ads across. This causes the internet to be of hinderance because it does not allow us to read deeply, which leads to new ideas of ones own. (transitional sentance)
how we read:
The brain is a complicated thing, is it posible that new technology affect its makeup, and if so, what implications does this have (neither talk long enough on this)? goog puts forth that neuroscienct tell us that the emergence of technology changes our physical brains, (not shure about goog). smart counters this with saying that brain resurch is still young, and is thusly to early to tell. Also that is the reason that institutions such as church to universities exist, so that deep thinking continues to exist.
good
changing intelegence (maby not covered)
Does new technology shape what is veiwed as being intelligent, and ~~is~~ if so what implication does this have? goog argues that intelligence is starting to be "a belief that intelligence is the output of a mechanical process, a series of discrete steps that can be isolated, measured, and optimized." goog belives

2012 AP Chem Free-Response

#1

a) (i) ~~$OH^- + HA \rightarrow H_2O + A^-$~~

~~@ F~~ @ Eq PH is 7 7.

b) ~~Na+~~

$NaOH \rightarrow Na^+ + OH^-$

$OH^- + HA \rightarrow H_2O + A^-$

c)

Worksheet
Volumes of solids—Disk and washer method
AP Calculus

Name David Crosby

Find the volume of the solid formed by the equations:

1.) $y = x^2$, $y = 0$, $x = 2$, is rotated about:
a.) the x-axis
b.) the y-axis
c.) the line $y = 4$
d.) the line $x = 2$

a) $\pi \int_0^2 x^{2^2}\,dx$

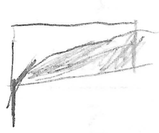
b) $\pi \int_0^4 \sqrt{y}^{\,2}\,dy$

c) $\pi \int_0^2 (x^2-4)^2\,dx$

d) $\pi \int_0^4 2^2 - (2-x^2)^2\,dx$

d) $\pi \int_0^4 (\sqrt{y}-2)^2\,dy$

2.) $y = 1 + \sqrt{x}$, $y = 1$, $x = 4$ is rotated about:
a.) the x-axis
b.) the y-axis
c.) the line $y = 3$
d.) the line $x = 6$



a) $\pi \int_0^4 (1+\sqrt{x})^2\,dx - \pi\cdot 4\cdot 1$

b) $\pi \int_1^3 (1-y)^4\,dy + \pi\cdot 2\cdot 4^2$

c) $\cancel{\pi \int_0^4 (1+\sqrt{x}}$

3.) $y = x^2$ and $y = \sqrt[3]{x}$ is rotated about:
a.) the x-axis
b.) the y-axis
c.) the line $y = 1$

$\frac{14}{20}$

Quiz 5.5 Form A AP Calculus AB Name Pwit Crisby

Derivatives & Integrals of bases other than *e* Period 7 3rd

Problems 1-3 Find the derivative. (4 points for each problem)

1. $f(x) = 2^{5x}$ $2^{5x} \cdot \ln(2) \cdot 5$

2. $f(x) = 2^x(\sin x)$ $2^x \cdot \ln(2)(\sin(x)) + 2^x \cdot \cos(x)$

3. $f(x) = \log_2(3x-1)$ $1/\ln(2)$

-4

$\frac{1}{2^{3x-1} \cdot \ln(2) \cdot 3}$ $\frac{1}{\cancel{2^{3(x)-1}} \cdot \ln(2) \cdot 3}$

error

$\frac{1}{\ln(2) \cdot \log_2(3x-1)} \cdot 3$?

-2 4. $\int 5^x dx$ $5^x (\ln(5)) + C$

error

$\boxed{\left(\frac{1}{\ln 5}\right)(5^x) + C}$

5. $\int \frac{2^{3x}}{1+2^{3x}} dx$.

$u = 1 + 2^{3x}$

$du = 3 \cdot 2^x \cdot \ln(2)$

$\frac{1}{\cancel{3 \cdot 2^x}}$

$\frac{1}{3\ln(2)} \ln(1 + 2^{3x}) + C$

$$\frac{g(x)}{f(x)} = \frac{A}{(\ldots)} + \frac{B}{(f(x))} + \ldots$$

$A =$

$\text{Coefficients}(g(x)) = C_g$ lowercase will be known

$\text{roots}(f(x)) = r$

$A =$

\# ~~g(x)~~ $\text{Terms}(h(x)) = T_n$

~~Coeff~~

$T_{n1} = (aA + bB + \ldots)$

$$T_{nm} = \frac{x^n(cA + dB + \ldots)}{x^{(n-(m-1))}}$$

$$h(x) = \frac{A\prod r}{r_1} + \frac{B\prod r}{r_2} + \ldots$$

$$= x^n(aA + bB + \ldots) + x^{n-1}(cA + dB + \ldots) + \ldots$$

$C_{g_1} = (aA + bB + \ldots)$

$C_{g_2} = (cA + dB + \ldots)$

$\vdots$

$\text{Solve system}(C_g = T_n) = [A, B, \ldots]$

My statistical guesses at formula's

line of best fit

$$y - \bar{y} = \bar{M}(x - \bar{x}) \qquad \bar{y} = \frac{\Sigma(Y_i)}{N_i} \qquad \bar{X} = \frac{\Sigma(X_i)}{N_i}$$

$$B(x) = \bar{M}(x - \bar{x}) + \bar{y} \qquad \bar{M} = \frac{\sum_{i=0}^{n-1} \frac{Y_{i+1} - Y_i}{X_{i+1} - X_i}}{n-1} = \text{mean slope}$$

how well the line fits the data: $F = \dfrac{\Sigma((Y_i - B(i))^2)}{n-1}$

Comparing what I ought to get to what you're getting is matching [illegible]

X axis →	1	2	3	4
O	0	3	2	5
E	1	2	3	4
d	-1	1	-1	1

although this doesn't take into account expect variation on variation.

~~$X_d = 0$~~

Some of observed to Expected

item	1	2	3	4	5
1	1	2	7	10	30
2	2	5	6	13	21
3	3	7	8	14	34
4	2	4	10	18	35
5	2	3	8	17	32
E	2	4	8	16	32

$Z_1 = 0$ $\quad Z_2 =$

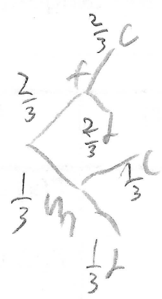
$Z_2 = -.232$

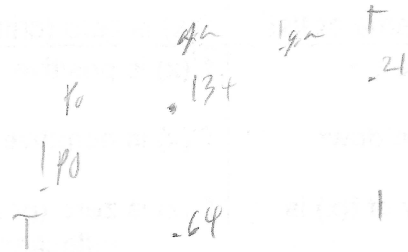
$Z_3 = -.345$

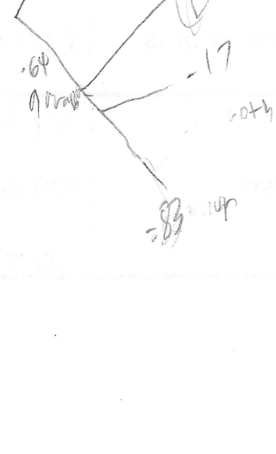
$Z_4 = -.354$

$Z_5 = 0$

$\bar{Z} = -.09$ → Conservative this ~~for testing~~ for alpha







Name: ____________________ Period: ____

Answer List:

1. Problem #1
   (a) 1.997
   (b) 2.347
   (c) 30.271
   (d) 7.375

2. Problem #2
   (a) 1.599
   (b) 8.779
   (c) 11.310
   (d) 25.061

3. Problem #3
   (a) 1.056
   (b) 13.900
   (c) 6.006
   (d) 0.218

4. Problem #4
   (a) 6.638
   (b) 77.337
   (c) 35.629
   (d) 89.495

5. Problem #5
   (a) 2.395
   (b) 20.987
   (c) 34.032
   (d) 1.584

6. Problem #6
   (a) 0.744 *(Hint: Try splitting into two integrals.)
   (b) 0.493
   (c) 1.335 *(Hint: Try splitting into two integrals. Also try both disk and shell methods.)
   (d) 3.252 *(Hint: Try splitting into two integrals. Also try both shell and washer methods.)

7. Problem #7
   (a) 1.126 *(Hint: Try splitting into two integrals.)
   (b) 16.131 *(Hint: Try splitting into two integrals. Also try both shell and washer methods.)
   (c) 0.147 *(Hint: Try splitting into two integrals.)
   (d) 12.945 *(Hint: Try solving for x in terms of y, and create an integral with respect to y.)

$$\frac{\int M\,(x+y) \text{ about } y}{\int M\,(x+y) \text{ about } y}$$

$a_n = a\cancel{x}_n + b \qquad a_0 = c$

$a_1 = a \cdot c + b$

$a_2 = a(a(c) + b) + b \quad = (a^2 + ab + b$

$a_3 = a(a(a(c) + b) + b) + b = a(a^2c + ab + b) + b$

$= a^3c + a^2b + ab + b$

$c(a^3) + b(a^2 + a + 1)$

$c \cdot a^n + b \cdot \sum_{z=0}^{n-1} a^z$

$a_n = 2x + 1 \qquad a_0 = 3$

$a_0 = 3 \quad = 3 \cdot 2^0 + 1 \cdot \sum_{z=0}^{-1} a^n = 3 \qquad b(a^n - 1)$

$a_1 = 2(3) + 1 = 7 = 3 \cdot 2^1 + 1 \cdot \sum_{z=0}^{0} a^n = 6 + 1 = 7 \qquad 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = 2^5 - 1$

$c a^n + b a^n - b$

$a_2 = 2(2(3) + 1) + 1 = 15 = 3 \cdot 2^2 + 1 \cdot 2^2 - 1 = 12 + 4 - 1 = 15$

$a_n = b a_n + c \qquad a_0 = \cancel{D} \rightarrow D \cdot b^n + c \cdot b^n - c$

$z_n = (z_{n-1})^a + b \cdot z_{n-1} + c \qquad z_0 = D$

$z_0 = D$

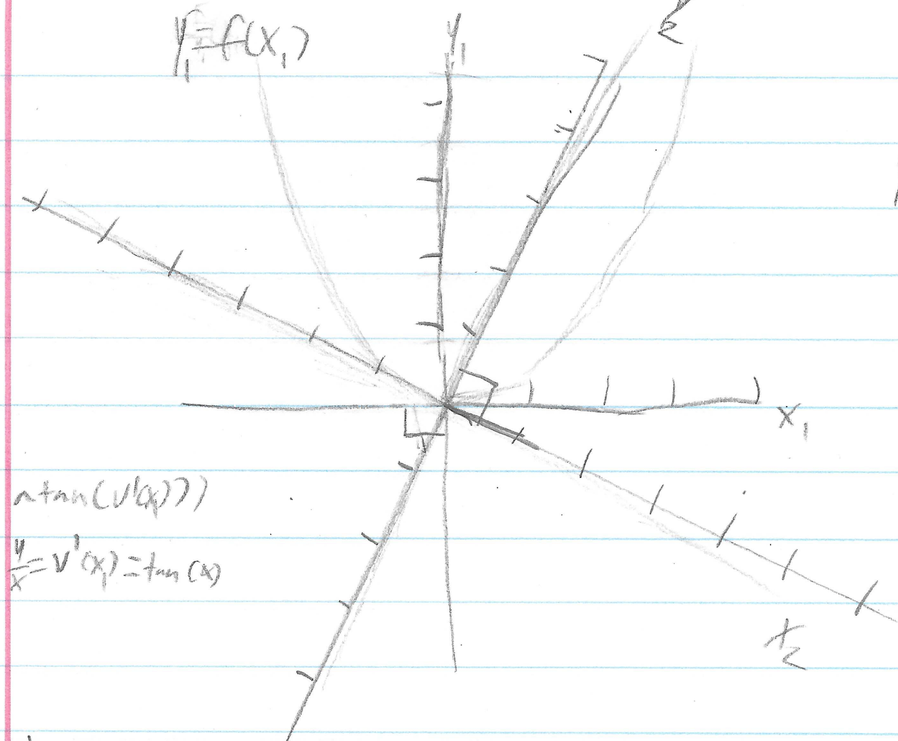
$z_1 = (\cancel{z_0}) D^a + b \cdot D + c$

$z_2 = (D^a + b \cdot D + c)^a + b(D^a + b \cdot D + c) + c$

$z_3 = ((D^a + b \cdot D + c)^a + b(D^a + bD + c) + c)^a + b((D^a + bD + c)^a +$
$b(D^a + bD + c) + c) + c$

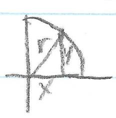
$Y_2 = V(X_1)$

~~Rotating~~ flipping over a given line



$Y_1 = M(X_2)$

$\cos(\operatorname{atan}(V'(x)))$



$\frac{y}{x} = V'(x) = \tan(x)$

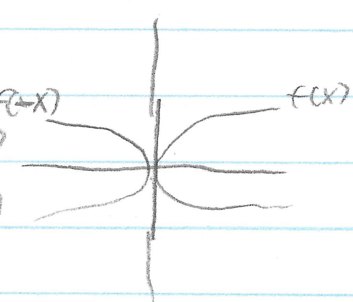
$| Y_2 = | X_1 \cdot \cos(\operatorname{atan}(V'(X_1))) + | Y_1 \cdot \sin(\operatorname{atan}(V'(X_1)))$

$| X_2 = | X_1 \cdot \sin(\operatorname{atan}(V'(X_1))) - | Y_1 \cdot \cos(\operatorname{atan}(V'(X_1)))$

$Y_1 = -X_2 \cdot \cos(\operatorname{atan}(M'(X_2))) + Y_2 \cdot \sin(\operatorname{atan}(M'(X_2)))$

$X_1 = X_2 \cdot \sin(\operatorname{atan}(M'(X_2))) + Y_2 \cdot \cos(\operatorname{atan}(M'(X_2)))$

$Y_1 = f(X_1)$ convert to X_2, Y_2 axis



$-X_2 \cdot \cos(\operatorname{atan}(M'(X_2))) + Y_2 \cdot \sin(\operatorname{atan}(M'(X_2)))$
$= f(X_2 \cdot \sin(\operatorname{atan}(M'(X_2))) + Y_2 \cdot \cos(\operatorname{atan}(M'(X_2))))$
$\downarrow$

flip X_2 sign

$X_2 \cdot \cos(\operatorname{atan}(M'(X_2))) + Y_2 \cdot \sin(\operatorname{atan}(M'(X_2))) = f(-X_2 \cdot \sin(\operatorname{atan}(M'(X_2))) + Y_2 \cdot \cos(\operatorname{atan}(M'(X_2))))$

$\downarrow$ simplify to

$Y_2 = g(X_2)$ convert back to Y_1, X_1 axis

$X_1 \cdot \cos(\operatorname{atan}(V'(X_1))) + Y_1 \cdot \sin(\operatorname{atan}(V'(X_1))) = g(X_1 \cdot \sin(\operatorname{atan}(V'(X_1))) - Y_1 \cdot \cos(\operatorname{atan}(V'(X_1))))$

$\downarrow$ simplify to $Y_1 = h(X_1)$, there's your function.

2.01 E6 g   .1.7401 g/mL

1149895.583 L H_2SO_4

19469.1 g H_2SO_4

$H_2SO_4 + Na_2CO_3 \rightarrow H_2CO_3 + Na_2SO_4$

$HCl + NH_3 \rightarrow NH_4Cl$ ~~$HNH_3 + Cl_2$~~

	HCl	NH_3
M	.8	?
L	.0175	.005
a	.014	

$HCOOH + NaOH \rightarrow H_2O + NaCOOH$

	$HCOOH$	$NaOH$
M	.2	.1105
L	.02	
a	.004	

$HCOOH + NaOH \rightarrow H_2O + NaCOOH$

	$HCOOH$	$NaOH$		
M	.2	.1105		
L	.02	.03543		
a	.004	.00391505	.00391505	.00391505
a	8.49 E-5	0		

M_a = .07210   .070624

E ln p2

$$\left(\prod_{n=0}^{\infty}\left(\frac{f^{(n)}(a)}{n!}(x-a)^n\right)\right)' = \left(e^{\sum_{n=0}^{\infty}\ln\left(\frac{f^{(n)}(a)}{n!}(x-a)^n\right)}\right)'$$

$$= e^{\sum_{n=0}^{\infty}\ln\left(\frac{f^{(n)}(a)}{n!}(x-a)^n\right)} \cdot \left(\sum_{n=0}^{\infty}\ln\left(\frac{f^{(n)}(a)}{n!}(x-a)^n\right)\right)'$$

$$f(n) = f(n-1) + n \qquad f(0) = 0$$

$$= \sum_{i=0}^{n} i \qquad f(1) = 0+1$$

$$f(2) = 0+1+2$$

$$f(n) = f(n-1)\cdot n \qquad f(0) = 1$$

$$f(1) = 1\cdot 1$$

$$f(2) = 1\cdot 1\cdot 2$$

$$f(3) = 1\cdot 1\cdot 2\cdot 3$$

$$f(n) = \prod_{i=1}^{n} i = e^{\sum_{i=1}^{n}\ln(i)}$$

$$\lim_{n\to\infty}(f(n)) = \lim_{n\to\infty}\left(\prod_{i=1}^{n} i\right) = \cancel{\lim} \; e^{\sum_{i=1}^{\infty}(\ln(i))}$$

$$\sum_{i=1}^{\infty}(\ln(i)) \overset{?}{<} \infty$$

$$n! = \prod_{i=1}^{n} i$$

$$\lim_{i\to\infty}(\ln(i)) = \infty$$

$f(n)$ diverses

$$(x!)' = \left(\prod_{i=1}^{x} i\right)'$$

$$e^{v} = \sum_{n=0}^{\infty}\frac{v^n}{n!}$$

$$= \left(e^{\sum_{i=1}^{x}\ln(i)}\right)'$$

$$v = \sum_{i=1}^{x}\ln(i)$$

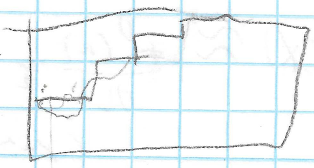
$$x! = \sum_{n=0}^{\infty}\frac{\left(\sum_{i=1}^{x}(\ln(i))\right)^n}{n!}$$

half derivative part 4

$f(x) = x^2$

$c = 0$

$x = 2$

$T_4^{1}(x) =$ 

$f(x) = x^2$

$f'(x) = 2x$

$f''(x) = 2$

$a = 1,\ x \to a^+$ $\quad f^{\frac{1}{2}}(1) = \lim_{x \to 1^+} \left(\frac{-2 \cdot \frac{1}{2}!}{\sqrt{x-1}} \cdot \left(-1 + \frac{1}{2} + \frac{2 \cdot 1}{1!}(x-1) + \frac{2}{2!}(x-1)^2 \right) \right)$

$\frac{-2 \cdot \frac{1}{2}!}{\sqrt{0 \to 0}} \cdot \left(-\frac{1}{2}\right) = \infty$

$a = 1,\ x \to \infty$

$f_a^{\frac{1}{2}}(1) = \lim_{x \to \infty} \left(\frac{-2 \cdot \frac{1}{2}!}{\sqrt{x-1}} \cdot \left(-x^2 + \frac{1}{2} + \frac{2 \cdot 1}{0!!}(x-1) + \frac{2}{2!}(x-1)^2 \right) \right)$

$\lim_{x \to \infty} \left(\frac{-2 \cdot \frac{1}{2}!}{\sqrt{x-1}} \left(-x^2 + \frac{1}{2} + 2x - 2 + x^2 - 2x + 1 \right) \right)$

$\frac{-2 \cdot \frac{1}{2}!}{\sqrt{x-1}} \left(\cancel{-\frac{1}{2}} \right)$ $\quad +\frac{1}{2} - 1$

$f_\infty^{\frac{1}{2}}(1) = 0$ $\qquad$ this method doesn't work.

---

half derivative M2 p1

$f(x) = x^a$

$n^7 \cdot n^6 \cdot 7 \to n^5 \cdot 6 \cdot 7 \to n^4 \cdot 5 \cdot 6 \cdot 7$ (0, 1, 2, 3)

$n^5 \cdot \frac{7!}{5!}$ $\quad n^4 \cdot \frac{7!}{4!}$

$f^{(n)}(x) = x^{(a-n)} \cdot \frac{a!}{(a-n)!}$

$x! = \Gamma(x+1)$

$f^{(r)}(x) = x^{(a-r)} \cdot \frac{\Gamma(a+1)}{\Gamma(a-r+1)}$ $\qquad f^{\frac{1}{2}}(x) = x^{\left(a-\frac{1}{2}\right)} \cdot \frac{\Gamma(a+1)}{\Gamma\left(a-\frac{1}{2}+1\right)}$

Half derivative M 2 P 2

$$f^{(r)}(x) = x^{(a-r)} \cdot \frac{\Gamma(a+1)}{\Gamma(a-r+1)}$$

for ~~polynomial~~ monomial

$$f^{\frac{1}{2}}(x) = x^{(a-\frac{1}{2})} \cdot \frac{\Gamma(a+1)}{\Gamma(a+\frac{1}{2})}$$

$f(x) = x^2$

$$f^{\frac{1}{2}}(x) = x^{\frac{3}{2}} \cdot \frac{\Gamma(3)}{\Gamma(\frac{3}{2})}$$

$$f^{\frac{1}{2}}(1) = \frac{8}{3\sqrt{\pi}} \approx 1.504\ldots \qquad f^{\frac{1}{2}}(0) = 0$$

$f(1) = 1$

$f'(1) = 2$

$$f(x) = \sum_{n=0}^{\infty} \frac{f^{(n)}(0)}{\Gamma(n+1)} \cdot (x)^n$$

$$f'(x) = \sum_{n=0}^{\infty} \left(\frac{f^{(n)}(0)}{\Gamma(n+1)} x^n\right)'$$

$$f^{(r)}(x) = \sum_{n=0}^{\infty} \frac{f^{(n)}(0)}{\cancel{\Gamma(n+1)}} \cdot x^{(n-r)} \cdot \frac{\cancel{\Gamma(n+1)}}{\Gamma(n-r+1)}$$

$$f^{(r)}(x) = \sum_{n=0}^{\infty} \frac{f^{(n)}(0)}{\Gamma(n-r+1)} \cdot x^{(n-r)}$$

$f(x) = e^x$

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

$$\frac{d^{\frac{1}{2}} e^x}{dx^{\frac{1}{2}}} = \sum_{n=0}^{\infty} \frac{x^{(n-\frac{1}{2})}}{\cancel{\Gamma(n+1)}} \cdot \frac{\cancel{\Gamma(n+1)}}{\Gamma(n+\frac{1}{2})}$$

$$= \sum_{n=0}^{\infty} \frac{x^{(n-\frac{1}{2})}}{\Gamma(n+\frac{1}{2})}$$

$$f^{\frac{1}{2}}(2) = \sum_{n=0}^{\infty} \frac{2^{(n-\frac{1}{2})}}{\Gamma(n+\frac{1}{2})} = \frac{1}{\sqrt{2}\cdot\Gamma(\frac{1}{2})} + \frac{\sqrt{2}}{\Gamma(\frac{3}{2})} + \frac{2^{3/2}}{\Gamma(\frac{5}{2})} + \ldots$$

$$= \frac{1}{\sqrt{2}\sqrt{\pi}} + \frac{2^{3/2}}{\sqrt{\pi}} + \frac{2^{7/2}}{3\sqrt{\pi}} + \ldots$$

$$= 4.1224$$

$$\sum_{n=0}^{99} \frac{2^{(n-\frac{1}{2})}}{\Gamma(n+\frac{1}{2})} = 7.4517$$

$$\left(e^3_{100}\right)^{\left(\frac{1}{2}\right)} = \cancel{7.45}\ 20.123 \qquad e^3 = 20.085 \qquad e^2 = 7.389$$

$$\sum_{n=0}^{400} \frac{2^{(n-\frac{1}{2})}}{\Gamma(n+\frac{1}{2})} = 7.4517$$

wx maxima: f(r,x):= sum(at(diff(g(c),c,n),c=0)*x^(n-r)/gamma(n-r+1),n,0,100);

Half Derivative M 2 P4 continuation of P3

$$\frac{d^r x}{dx^r} = \sum_{n=0}^{\infty} \frac{f^{(n)}(0) \cdot x^{(n-r)}}{\Gamma(n-r)} \qquad \Gamma(x) = \frac{1}{\frac{1}{\Gamma}(x)}$$

$$e^x = \sum_{n=0}^{5} \frac{x^n}{n!} \approx \sum_{n=0}^{5} \frac{x^{n-\frac{1}{2}}}{\Gamma(n-\frac{1}{2})}$$

for $x \in [1, \ldots, 5]$

coefficient matrix

$$C = \begin{array}{c|c} & \begin{matrix} 0 & 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ \frac{1}{\sqrt{2}} & \sqrt{2} & 2^{3/2} & 2^{5/2} & 2^{7/2} \\ \frac{1}{\sqrt{3}} & \sqrt{3} & 3^{3/2} & 3^{5/2} & 3^{7/2} \\ \frac{1}{\sqrt{4}} & \sqrt{4} & 4^{3/2} & 4^{5/2} & 4^{7/2} \\ \frac{1}{\sqrt{5}} & \sqrt{5} & 5^{3/2} & 5^{5/2} & 5^{7/2} \end{bmatrix} \end{array}$$

answer matrix

$$\begin{bmatrix} \frac{163}{60} \\ \frac{109}{15} \\ \frac{92}{5} \\ \frac{643}{15} \\ \frac{1097}{12} \end{bmatrix} = A$$

~~Adjacent~~ Variable matrix - Probably 5.26 ... ss

$$\begin{bmatrix} \approx \Gamma(-\frac{1}{2}) \\ \approx \Gamma(\frac{1}{2}) \\ \approx \Gamma(\frac{3}{2}) \\ \approx \Gamma(\frac{5}{2}) \\ \approx \Gamma(\frac{7}{2}) \end{bmatrix} = V$$

$|C| = \cancel{-130.4632}$ 26.29

$$\Gamma(-\tfrac{1}{2}) = \frac{\begin{vmatrix} \frac{163}{60} & 1 & 1 & 1 & 1 \\ \frac{109}{15} & \sqrt{2} & 2^{3/2} & 2^{5/2} & 2^{7/2} \\ \frac{92}{5} & \cdot & \cdot & \cdot & \cdot \\ \frac{643}{15} & \cdot & \cdot & \cdot & \cdot \\ \frac{1097}{12} & \cdot & \cdot & \cdot & \cdot \end{vmatrix}}{|C|}$$

$5.26 \approx$

$\frac{1}{\Gamma}(-\frac{1}{2}) = .19$

$\Gamma(\frac{1}{2}) = -9.865$

$\frac{1}{\Gamma}(\frac{1}{2}) = -.10136$

$\Gamma(\frac{3}{2}) = 9.696$

$\frac{1}{\Gamma}(\frac{3}{2}) = .10366$

half derivative M2 P3

$$\frac{d^r x}{dx^r} = \sum_{n=0}^{\infty} \frac{f^{(n)}(0)\cdot x^{(n-r)}}{\underset{\sim}{!}(n-r)}$$

$\underset{\sim}{!}$ is continuous?

$$\underset{\sim}{!}(x) \overset{?}{\approx} \Gamma(x+1)$$

$\underset{\sim}{!}(n) = n!,\ n \in \mathbb{I}$ $\quad \overset{\sim}{!}(x) = \frac{1}{\underset{\sim}{!}(x)}$

$$\frac{d^{\frac{1}{2}} e^x}{dx^{\frac{1}{2}}} = \sum_{n=0}^{\infty}$$

$$\frac{d^r e^x}{dx^r} = e^x$$

$$\sum_{n=0}^{\infty} \frac{x^n}{n!} = \sum_{n=0}^{\infty} \frac{x^{(n-r)}}{\underset{\sim}{!}(n-r)}$$

$$\sum_{n=1}^{\infty} \frac{x^n}{n!} - \sum_{n=0}^{\infty} \frac{x^{(n-r)}}{\underset{\sim}{!}(n-r)} = 0$$

$$0 = \sum_{n=0}^{\infty} \frac{x^n \cdot \underset{\sim}{!}(n-r) - x^{(n-r)} \cdot n!}{n! \cdot \underset{\sim}{!}(n-r)}$$

$$\sum_{n=0}^{6} \frac{1^n}{n!} \approx \sum_{n=0}^{6} \frac{1^{n-\frac{1}{2}}}{\underset{\sim}{!}(n-\frac{1}{2})}$$

$$\overset{0}{\frac{1}{1}} + \overset{1}{\frac{1}{1}} + \overset{2}{\frac{1}{2}} + \overset{3}{\frac{1}{6}} + \frac{1}{24} + \frac{1}{120} \overset{\frac{163}{60}}{\approx} \frac{1}{\underset{\sim}{!}(0-\frac{1}{2})} + \frac{1}{\underset{\sim}{!}(1-\frac{1}{2})} + \frac{1}{\underset{\sim}{!}(2-\frac{1}{2})} + \frac{1}{\underset{\sim}{!}(3-\frac{1}{2})} + \frac{1}{\underset{\sim}{!}(4-\frac{1}{2})} + \frac{1}{\underset{\sim}{!}(5-\frac{1}{2})}$$

$$\sum_{n=0}^{5} \frac{2^n}{n!} \approx \sum_{n=0}^{5} \frac{2^{n-\frac{1}{2}}}{\underset{\sim}{!}(n-\frac{1}{2})}$$

$$\frac{1}{1} + \frac{2}{1} + \frac{4}{2} + \frac{8}{6} + \frac{16}{24} + \frac{32}{120} \overset{\frac{109}{15}}{\approx} \frac{\cancel{1+2+4+8+16+32}}{\underset{\sim}{!}(-\frac{1}{2})\ \underset{\sim}{!}(\frac{1}{2})\ \underset{\sim}{!}(1\frac{1}{2})\ \underset{\sim}{!}(2\frac{1}{2})\ \underset{\sim}{!}(3\frac{1}{2})\ \underset{\sim}{!}(4\frac{1}{2})}$$

$$0 \approx \overset{\sim}{!}(-\tfrac{1}{2}) + 2\overset{\sim}{!}(\tfrac{1}{2}) + 8\overset{\sim}{!}(\tfrac{3}{2}) + 16\overset{\sim}{!}(\tfrac{7}{2}) + 32\overset{\sim}{!}(\tfrac{9}{2}) - \frac{109}{15}$$

half derivative n=2 r 5

continuation of p4

n=5

$\underset{1}{\sim}(-\frac{1}{2}) \approx 5.26$ $\qquad$ $\overset{1}{\sim}(-\frac{1}{2}) \approx -.19$

$\underset{1}{\sim}(\frac{1}{2}) \approx -4.865$ $\qquad$ $\overset{1}{\sim}(\frac{1}{2}) \approx -.10136$

$\underset{1}{\sim}(\frac{3}{2}) \approx 4.646$ $\qquad$ $\overset{1}{\sim}(\frac{3}{2}) \approx .10366$

$\underset{1}{\sim}(\frac{5}{2}) \approx -2.922$ $\qquad$ $\overset{1}{\sim}(\frac{5}{2}) \approx -.342$

$\underset{1}{\sim}(\frac{7}{2}) \approx .5962$ $\qquad$ $\overset{1}{\sim}(\frac{7}{2}) \approx 1.677$

$\frac{163}{60} \overset{?}{\approx} 1 \cdot \underset{1}{\sim}(-\frac{1}{2}) + \underset{1}{\sim}(\frac{1}{2}) + \underset{1}{\sim}(\frac{3}{2}) + \underset{1}{\sim}(\frac{5}{2}) + \underset{1}{\sim}(\frac{7}{2})$

$2.71\overline{6} \approx 5.26 - 4.865 + 4.646 - 2.922 + .5962$

≈ 2.7152 ✓

$\frac{109}{15} \approx \frac{1}{\sqrt{2}} \cdot \underset{1}{\sim}(-\frac{1}{2}) + \sqrt{2} \cdot \underset{1}{\sim}(\frac{1}{2}) + 2^{3/2} \cdot \underset{1}{\sim}(\frac{3}{2}) + 2^{5/2} \cdot \underset{1}{\sim}(\frac{5}{2}) + 2^{7/2} \cdot \underset{1}{\sim}(\frac{7}{2})$

$7.2\overline{6} \approx 7.267$ ✓