对于我这种习惯了把高阶导放后面的student来说，以这个为排序标准会导致一些不得不出现的规则，不像以下这种排序规则那么好。。：

f(x)g(x)=f(x)’g(x)+f(x)g(x)’

f(x)g(x)→f(x)’g(x)→f(x)’g(x)’

f(x)g(x)→f(x)g(x)’→f(x)’g(x)’

如果以下表格用这种方法写，那么会省很多事。。

蓝色(更准确地说：从↙到↗的奇数列)是The order1：(g(x)f(x))’=f(x)g(x)’+g(x)f(x)’

红色(更准确地说：从↙到↗的偶数列)是The order1’：(f(x)g(x))’=g(x)’f(x)+f(x)’g(x)

其中The order1’是The order1的全逆序形式(或者说它俩互为全逆序)，即函数名相替换(不带走导数阶数记号)+乘法逆序(要带走导数阶数)+加法也逆序的形式

其中的道理是：

1.奇到偶到偶：→(→↓)=先1前再1’后=g(x)f(x)到f(x)g(x)’再到f(x)’g(x)’

=奇到奇到偶：(↓→)→=先1 后再1前=g(x)f(x)到g(x)f(x)’再到f(x)’g(x)’

2.偶到奇到奇：→(→↓)=先1’前再1后=f(x)g(x)到g(x)’f(x)再到g(x)’f(x)’

=偶到偶到奇：(↓→)→=先1’后再1’前=f(x)g(x)到f(x)’g(x)再到g(x)’f(x)’

这样便可保证：两条平行四边形路径通往同一个具体式子，并且包括符号的前后顺序。

那么因此，对于不会求的空格，请模仿它所在的←或←↑的空格，该空格所在的斜列的各个格子(甚至所有同类的格子)，是怎么分裂出自己的小弟到自己的→或→↓的空格的。

求g(x)f(x)的n阶导。

|  |  |  |  |
| --- | --- | --- | --- |
| g(x)f(x) | f(x)g(x)’ | 1g(x)’’f(x) | 1f(x)g(x)’’’ |
|  | g(x)f(x)’ | 2f(x)’g(x)’ | (2+1) g(x)’’f(x)’ |
|  |  | 1g(x)f(x)’’ | (1+2) f(x)’’g(x)’ |
|  |  |  | 1g(x)f(x)’’’ |

不用The order1 所对应的(g(x)/f(x))’=[f(x)g(x)’-g(x)f(x)’]/，而采取通过复合来求。

|  |  |  |  |
| --- | --- | --- | --- |
| g(x) | f(x)’ | 1g(x)’’ | 1g(x)’’’ |
|  | g(x)’ | 2’g(x)’ | (2+1) g(x)’’’ |
|  |  | 1g(x)’’ | (1+2)’’g(x)’ |
|  |  |  | 1g(x)’’’ |

那么首先我们得求出复合函数的n阶导公式。

除了先前的红蓝双方这种斜对角线规则，我们还得另设：

规则1：总把奇数列所分解出的运算得来过程较为简单的写在前面，它的不同种类的小弟用不同颜色区分着写完后，再写偶数列的的同种函数，[蓝色，红色)之间属于↖或者←的蓝色，[红色之后]属于←或者↖的红色，并且相同颜色表示可合并同类项，同一个方框内的红色和蓝色也是可合并同类项的(总的来说，蓝色优先级高)

规则2：同一个函数的各阶导函数的乘积，按照低阶到高阶=从左到右排列

规则3：求导求出来的数字在word公式内，同类项合并出来的数字在word公式外

规则4：左或左上的格子里若为多个不同类的式子相加，该格子右或右下的格子里的导数不用对应颜色区分它们是由那个格子中的哪一项得来的(那么不同格子之间的除了红蓝之外的相同颜色并非一定有意义。)[因为颜色的区分功能只用于区分该格子中同类项之间，当两者冲突时，优先保证这个利益。]，(但要区分是从哪个格子得来的[即头文字的颜色：红or蓝])，不过它们的排列顺序与所属对象多对一地从上到下排列。

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| f(u(x))’ | f(u)’u(x)’ | f(u)’’ | 1f(u)’’’ | 1f(u)’’’’ | 1f(u)’’’’’ |
|  |  | f(u)’u(x)’’ | 1u(x)’u(x)’’f(u)’’  +f(u)’’ | 1f(u)’’’  +3f(u)’’’ | 6f(u)’’’’  +f(u)’’’’ |
|  |  |  | 1f(u)’u(x)’’’ | 1u(x)’u(x)’’’f(u)’’  +3u(x)’u(x)’’’f(u)’’  +3f(u)’’ | 6f(u)’’’  +6f(u)’’’  +4f(u)’’’  +3f(u)’’’ |
|  |  |  |  | 1f(u)’u(x)’’’’ | 1u(x)’u(x)’’’’f(u)’’  +3u(x)’u(x)’’’’f(u)’’  +3u(x)’’u(x)’’’f(u)’’  +3f(u)’’ |
|  |  |  |  |  | 1f(u)’u(x)’’’’’ |

下面来求

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (-1)f(x)’ | (-1)(-2)f(x)’ | 1g(x)’’ | 1g(x)’’’ |
|  |  | g(x)’ | 2’g(x)’ | (2+1) g(x)’’’ |
|  |  |  | 1g(x)’’ | (1+2)’’g(x)’ |
|  |  |  |  | 1g(x)’’’ |

f1···fn(都)是关于x的函数

(f1···fn)’=(f1···fn-1)fn’+ (f1···fn-1)’fn

(f1···fn-1)’fn=(f1···fn-2)fn-1’(fn)+(f1···fn-2)’fn-1fn

(f1···fn-2)’fn-1fn=(f1···fn-3)fn-2’(fn-1fn)+(f1···fn-3)’fn-2fn-1fn

(f1···fn-3)’fn-2fn-1fn=(f1···fn-4)fn-3’(fn-2fn-1fn)······

同时这里也可以对数求导直接求到它：

(f1···fn)’=

(f1···fn)’’=

(f1···fn)’’’=

蓝色(更准确地说：从↑到↓的奇数列)是The order2：(f(x)g(x))’=f(x)g(x)’+g(x)f(x)’

红色(更准确地说：从↑到↓的偶数列)是The order2’： (g(x)f(x))’=g(x)’f(x)+f(x)’g(x)

其中The order2’是The order2的全逆序形式(或者说它俩互为全逆序)，即函数名相替换+乘法逆序+加法逆序的形式

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| (f1···fn) | 1 | 1 | 1 | 1 |
|  |  | 1 | 2 | 3 |
|  |  |  | 1 | 3 |
|  |  |  |  | 1 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| f(u(x))’ | f(u)’u(x)’ | f(u)’’ | 1f(u)’’’ | 1f(u)’’’’ | 1f(u)’’’’’ |
|  |  | f(u)’u(x)’’ | f(u)’’  +1f(u)’’u(x)’u(x)’’ | 1f(u)’’’  +3f(u)’’’ | f(u)’’’’  +6f(u)’’’’ |
|  |  |  | 1f(u)’u(x)’’’ | 3f(u)’’u(x)’u(x)’’’  +3f(u)’’  +1f(u)’’u(x)’u(x)’’’ | 6f(u)’’’  +6f(u)’’’  +4f(u)’’’  +3f(u)’’’ |
|  |  |  |  | 1f(u)’u(x)’’’’ | 3f(u)’’u(x)’u(x)’’’’  +3f(u)’’u(x)’’u(x)’’’  +3f(u)’’  +1f(u)’’u(x)’u(x)’’’’ |
|  |  |  |  |  | 1f(u)’u(x)’’’’’ |

2.具体地有：

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  | + |
|  |

其实从这里开始，左斜排和右斜排的映射关系就不等了(等是相等，但具体形式不等。。)。。

现写作

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|  |  |  |
|  |

这时候又引入了第三斜排，其中第三斜排的运算规律与第二斜排的相等，不等于第一斜排的。

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| --- | --- | --- | --- |
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|  |  |

其结果为：

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