一、测试功能

1.科学计算界面自适应测试

伸缩窗口大小，界面根据窗口形状有两种布局，显示皆正常。

2. 科学计算功能测试

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| --- | --- |
| 序号 | 功能 |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |
| 11 |  |
| 12 |  |
| 13 |  |
| 14 |  |
| 15 | 复合运算符 |
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二、边界值测试

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| 编号 | 输入 | 输出 |
| 1 | log(2) | 0.69897000433601880478626110527551 |
| 2 | log(2147483647) | 9.3319298653811829240651035172848 |
| 3 | log(2147483648) | 9.3319298655834170516259057364593 |
| 4 | log(1) | 0 |
| 5 | log(0) | Invalid input |
| 6 | log(-1) | Invalid input |
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|  | | |
| 编号 | 输入 | 输出 |
| 1 | ln(2) | 0.69314718055994530941723212145818 |
| 2 | ln(0) | Invalid input |
| 3 | ln(-2) | Invalid input |
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| --- | --- | --- |
|  | | |
| 编号 | 输入 | 输出 |
| 1 | 7 mod 2 | 0 |
| 2 | -3 mod 2 | -1 |
| 3 | 5 mod -2 | 1 |
| 4 | -5 mod -2 | -1 |
| 5 | 0 mod 2 | 0 |
| 6 | 2 mod 0 | result is undefined |
| 7 | 0 mod 0 | result is undefined |
|  |  |  |

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| --- | --- | --- |
|  | | |
| 编号 | 输入 | 输出 |
| 1 | sqrt(0) | 0 |
| 2 | sqrt(2) | 0.69897000433601880478626110527551 |
| 3 | sqrt(-2) | Invalid input |
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| --- | --- | --- |
|  | | |
| 编号 | 输入 | 输出 |
| 1 |  | 1.7320508075688772935274463415059 |
| 2 |  | 3 |
| 3 |  | 0 |
| 4 |  | Cannot divide by zero |
| 5 |  | 0.57735026918962576450914878050196 |
| 6 |  | 0.33333333333333333333333333333333 |
|  |  |  |

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| 编号 | 输入 | 输出 |
| 1 | 10 ^ 0 | 1 |
| 2 | 10 ^ 9999 | 1.e+9999 |
| 3 | 10 ^ -9999 | 1.e-9999 |
| 4 | 10 ^ 10000 | Overflow |
| 5 | 10 ^ (-10000) | Overflow |
| 6 | 10 ^ 2147483647 | Invalid input |
|  |  |  |

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| --- | --- | --- |
|  | | |
| 编号 | 输入 | 输出 |
| 1 | 3^7 | 2187 |
| 2 | 2147483647^2187 | Overflow |
| 3 | 2147483647^2147483647 | Invalid input |
| 4 | 1^2147483647 | 1 |
| 5 | 0^0 | 1 |
| 6 | 0^5 | 0 |
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| 编号 | 输入 | 输出 |
| 1 | 0! | 1 |
| 2 | 1! | 1 |
| 3 | 3! | 6 |
| 4 | (-2)! | Invalid input |
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| 编号 | 输入 | 输出 |
| 1 | sin(0) DEG | 0 |
| 2 | sin(90) DEG | 1 |
| 3 | sin(-90) DEG | -1 |
| 4 | sin(2147483647) DEG | 0.79863551004729284628400080406894 |
| 5 | sin(-2147483647) DEG | -0.79863551004729284628400080406894 |
| 6 | sin(pai) RAD | 0 |
| 7 | sin(-pai) RAD | 0 |
| 8 | sin(2147483647) RAD | -0.7249165551445563905482932963398 |
| 9 | sin(-2147483647) RAD | 0.7249165551445563905482932963398 |
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| 编号 | 输入 | 输出 |
| 1 | sin-1(1) | 90 |
| 2 | sin-1(-1) | -90 |
| 3 | sin-1(0) | 0 |
| 4 | sin-1(2) | Invalid input |
| 5 | sin-1(-2) | Invalid input |
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| --- | --- | --- |
|  | | |
| 编号 | 输入 | 输出 |
| 1 | cos(0) DEG | 1 |
| 2 | cos(90) DEG | 0 |
| 3 | cos(-90) DEG | 0 |
| 4 | cos(2147483647) DEG | -0.60181502315204827991797700044149 |
| 5 | cos(-2147483647) DEG | -0.60181502315204827991797700044149 |
| 6 | cos(pai) RAD | -1 |
| 7 | cos(-pai) RAD | -1 |
| 8 | cos(2147483647) RAD | -0.68883669187794383467975822303793 |
| 9 | cos(-2147483647) RAD | -0.68883669187794383467975822303793 |
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| 编号 | 输入 | 输出 |
| 1 | cos-1(1) DEG | 0 |
| 2 | cos-1(-1) DEG | 180 |
| 3 | cos-1(0) DEG | 90 |
| 4 | cos-1(2) DEG | Invalid input |
| 5 | cos-1(-2) DEG | Invalid input |
| 6 | cos-1(1) RAD | 0 |
| 7 | cos-1(-1) RAD | 3.1415926535897932384626433832795 |
| 8 | cos-1(0) RAD | 1.5707963267948966192313216916398 |
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| --- | --- | --- |
|  | | |
| 编号 | 输入 | 输出 |
| 1 | tan(0) DEG | 0 |
| 2 | tan(90) DEG | invalid input |
| 3 | tan(-90) DEG | invalid input |
| 4 | tan(2147483647) DEG | -1.3270448216204100371594725740869 |
| 5 | tan(-2147483647) DEG | 1.3270448216204100371594725740869 |
| 6 | tan(pai) RAD | 0 |
| 7 | tan(-pai) RAD | 0 |
| 8 | tan(2147483647) RAD | 1.0523779637351339136698139284747 |
| 9 | tan(-2147483647) RAD | -1.0523779637351339136698139284747 |
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| --- | --- | --- |
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| 编号 | 输入 | 输出 |
| 1 | tan-1(1) | 45 |
| 2 | tan-1(-1) | -45 |
| 3 | tan-1(0) | 0 |
| 4 | tan-1(2) | 63.434948822922010648427806279547 |
| 5 | tan-1(-2) | -63.434948822922010648427806279547 |
| 6 | tan-1(2147483647) | 89.999999973319573542213650732095 |
| 7 | tan-1(-2147483647) | -89.999999973319573542213650732095 |
| 8 | tan-1(2147483647^8) | 90 |
| 9 | tan-1(-2147483647^8) | -90 |
|  |  |  |

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| 复合运算符 | | |
| 编号 | 输入 | 输出 |
| 1 | sin-1(sin(180) | 0 |
| 2 | sin-1(sin(-90)) | -90 |
| 3 | cos-1(cos(-180)) | 180 |
| 4 | cos-1(cos(-90)) | 90 |
| 5 | tan-1(tan(90)) | Invalid input |
| 6 | tan-1(tan(180)) | 0 |
| 7 | log(3^5)/log(3) | 5 |
| 8 | log(3^(-5))/log(3) | -5 |
| 9 | log(10^1000) | 1000 |
| 10 | log(10^10000) | Overflow |
| 11 | (10 yroot 1000) ^ 1000 | 10 |
| 12 | (10 yroot 10000) ^ 10000 | 10 |
| 13 | (10 yroot 10000)^(10000^2) | Overflow |
| 14 | 5 mod 0 mod 2 | Result is undefined |
| 15 | 5 mod 2 mod 0 | Result is undefined |
| 16 | 0 mod 5 mod 2 | 0 |
| 17 | 10!/(2!\*8!) | 45 |
| 18 | 10!/2! | 1814400 |
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三、等价类测试

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|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | log(2) | 0.69897000433601880478626110527551 | 正 |
| 2 | log(0) | Invalid input | 负 |
| 3 | log(-1) | Invalid input | 零 |
|  |  |  |  |

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| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | ln(2) | 0.69314718055994530941723212145818 | 正 |
| 2 | ln(-2) | Invalid input | 负 |
| 3 | ln(0) | Invalid input | 零 |
|  |  |  |  |

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| --- | --- | --- | --- |
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| 编号 | 输入 | 输出 | 等价类 |
| 1 | 7 mod 2 | 0 | x正y正 |
| 2 | -3 mod 2 | -1 | x负y正 |
| 3 | 5 mod -2 | 1 | x正y负 |
| 4 | -5 mod -2 | -1 | x负y负 |
| 5 | 0 mod 2 | 0 | x零y正 |
| 6 | 2 mod 0 | result is undefined | x正y零 |
| 7 | 0 mod 0 | result is undefined | x零y零 |
| 8 | 0 mod -2 | 0 | x零y负 |
| 9 | -2 mod 0 | result is undefined | x负y零 |
|  |  |  |  |

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| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | sqrt(0) | 0 | 零 |
| 2 | sqrt(2) | 0.69897000433601880478626110527551 | 正 |
| 3 | sqrt(-2) | Invalid input | 负 |
|  |  |  |  |

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| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | 3 yroot 1 | 3 | x正y正 |
| 2 | 1 yroot 0 | Cannot divide by zero | x正y零 |
| 3 | 3 yroot -2 | 0.57735026918962576450914878050196 | x正y负 |
| 4 | 0 yroot 3 | 0 | x零y正 |
| 5 | 0 yroot 0 | Cannot divide by zero | x零y零 |
| 6 | 0 yroot -2 | Invalid input | x零y负 |
| 7 | -2 yroot 2 | Invalid input | x负y正 |
| 8 | -2 yroot 0 | Cannot divide by zero | x负y零 |
| 9 | -3 yroot -2 | Invalid input | x负y负 |
|  |  |  |  |

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| --- | --- | --- | --- |
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| 编号 | 输入 | 输出 | 等价类 |
| 1 | 10 ^ 0 | 1 | 零 |
| 2 | 10 ^ 9999 | 1.e+9999 | 正 |
| 3 | 10 ^ -9999 | 1.e-9999 | 负 |
|  |  |  |  |

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| 编号 | 输入 | 输出 | 等价类 |
| 1 | 2^4 | 16 | x正y正 |
| 2 | 2^0 | 1 | x正y零 |
| 3 | 2^-4 | 0.0625 | x正y负 |
| 4 | 0^4 | 0 | x零y正 |
| 5 | 0^0 | 1 | x零y零 |
| 6 | 0^-4 | Invalid input | x零y负 |
| 7 | -2^4 | 16 | x负y正 |
| 8 | -2^0 | 1 | x负y零 |
| 9 | -2^-4 | 0.0625 | x负y负 |
|  |  |  |  |

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| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | 10 ^ 0 | 1 | 零 |
| 2 | 10 ^ 9999 | 1.e+9999 | 正 |
| 3 | 10 ^ -9999 | 1.e-9999 | 负 |
|  |  |  |  |

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| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | sin(0) DEG | 0 | 零 |
| 2 | sin(90) DEG | 1 | 正 |
| 3 | sin(-90) DEG | -1 | 负 |
|  |  |  |  |

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| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | sin-1(1) | 90 | 正 |
| 2 | sin-1(-1) | -90 | 负 |
| 3 | sin-1(0) | 0 | 零 |
| 4 | sin-1(2) | Invalid input | 正无效 |
| 5 | sin-1(-2) | Invalid input | 负无效 |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | cos(0) DEG | 1 | 零 |
| 2 | cos(90) DEG | 0 | 正 |
| 3 | cos(-90) DEG | 0 | 负 |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | cos-1(1) DEG | 0 | 正 |
| 2 | cos-1(-1) DEG | 180 | 负 |
| 3 | cos-1(0) DEG | 90 | 零 |
| 4 | cos-1(2) DEG | Invalid input | 正无效 |
| 5 | cos-1(-2) DEG | Invalid input | 负无效 |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | tan(0) DEG | 0 | 零 |
| 2 | tan(90) DEG | invalid input | 正无效 |
| 3 | tan(-90) DEG | invalid input | 负无效 |
| 4 | tan(2147483647) DEG | -1.3270448216204100371594725740869 | 正 |
| 5 | tan(-2147483647) DEG | 1.3270448216204100371594725740869 | 负 |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| 编号 | 输入 | 输出 | 等价类 |
| 1 | tan-1(1) | 45 | 正 |
| 2 | tan-1(-1) | -45 | 负 |
| 3 | tan-1(0) | 0 | 零 |
|  |  |  |  |

四、小结

所有测试用例皆符合期望输出。

测试时发现，退回键只能退回已输入的数字，不能退回运算符号，设计不够人性化。

该科学计算器缺少组合数、排列数的计算功能，只能通过复合n！计算，不够便捷；缺少计算logy x的功能，只能通过复合logx计算，不够便捷。