Blog Entry © Tuesday, March 17, 2026, by James Pate Williams, Jr., Comparison of Power Series Arctangent and Arcsine Functions with the C++ Built-In Functions

```
Series arcsin Versus C++ asin
# Terms = 10
x        fx                sx                error
0.0000   0.00000000000     0.00000000000     0.00000000000
0.0400   0.04001067435     0.04001067435     0.00000000000
0.0800   0.08008558003     0.08008558003     0.00000000000
0.1200   0.12028988239     0.12028988239     0.00000000000
0.1600   0.16069065295     0.16069065295     0.00000000000
0.2000   0.20135792079     0.20135792079     0.00000000000
0.2400   0.24236585104     0.24236585104     0.00000000000
0.2800   0.28379410921     0.28379410921     0.00000000000
0.3200   0.32572948729     0.32572948729     0.00000000001
0.3600   0.36826789344     0.36826789344     0.00000000014
0.4000   0.41151684606     0.41151684607     0.00000000146
0.4400   0.45559867334     0.45559867340     0.00000001220
0.4800   0.50065471198     0.50065471240     0.00000008550
0.5200   0.54685094787     0.54685095070     0.00000051636
0.5600   0.59438578365     0.59438580000     0.00000275091
0.6000   0.64350102402     0.64350110879     0.00001317371
0.6400   0.69449786561     0.69449826563     0.00005759821
0.6800   0.74776089243     0.74776263466     0.00023299172
0.7200   0.80379522727     0.80380231893     0.00088226495
0.7600   0.86328581894     0.86331311502     0.00316178145
0.8000   0.92719468125     0.92729521800     0.01084193611
0.8400   0.99692405607     0.99728322237     0.03601447327
0.8800   1.07459493649     1.07586220045     0.11779054596
0.9200   1.16352789097     1.16808048521     0.38975004727
0.9600   1.26907787401     1.28700221759     1.39272048888

Series arcsin Versus C++ asin
# Terms = 20
x        fx                sx                error
0.0000   0.00000000000     0.00000000000     0.00000000000
0.0400   0.04001067435     0.04001067435     0.00000000000
0.0800   0.08008558003     0.08008558003     0.00000000000
0.1200   0.12028988239     0.12028988239     0.00000000000
0.1600   0.16069065295     0.16069065295     0.00000000000
0.2000   0.20135792079     0.20135792079     0.00000000000
0.2400   0.24236585104     0.24236585104     0.00000000000
0.2800   0.28379410921     0.28379410921     0.00000000000
0.3200   0.32572948729     0.32572948729     0.00000000000
0.3600   0.36826789344     0.36826789344     0.00000000000
0.4000   0.41151684607     0.41151684607     0.00000000000
0.4400   0.45559867340     0.45559867340     0.00000000000
```

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0.4800  0.50065471240   0.50065471240   0.00000000000
0.5200  0.54685095070   0.54685095070   0.00000000000
0.5600  0.59438580000   0.59438580000   0.00000000001
0.6000  0.64350110879   0.64350110879   0.00000000019
0.6400  0.69449826561   0.69449826563   0.00000000308
0.6800  0.74776263434   0.74776263466   0.00000004213
0.7200  0.80380231488   0.80380231893   0.00000050457
0.7600  0.86331306850   0.86331311502   0.00000538760
0.8000  0.92729473366   0.92729521800   0.00005223216
0.8400  0.99727854765   0.99728322237   0.00046874609
0.8800  1.07581929232   1.07586220045   0.00398825568
0.9200  1.16769020267   1.16808048521   0.03341229910
0.9600  1.28312470465   1.28700221759   0.30128253700

Series arcsin Versus C++ asin
# Terms = 30
x       fx              sx              error
0.0000  0.00000000000   0.00000000000   0.00000000000
0.0400  0.04001067435   0.04001067435   0.00000000000
0.0800  0.08008558003   0.08008558003   0.00000000000
0.1200  0.12028988239   0.12028988239   0.00000000000
0.1600  0.16069065295   0.16069065295   0.00000000000
0.2000  0.20135792079   0.20135792079   0.00000000000
0.2400  0.24236585104   0.24236585104   0.00000000000
0.2800  0.28379410921   0.28379410921   0.00000000000
0.3200  0.32572948729   0.32572948729   0.00000000000
0.3600  0.36826789344   0.36826789344   0.00000000000
0.4000  0.41151684607   0.41151684607   0.00000000000
0.4400  0.45559867340   0.45559867340   0.00000000000
0.4800  0.50065471240   0.50065471240   0.00000000000
0.5200  0.54685095070   0.54685095070   0.00000000000
0.5600  0.59438580000   0.59438580000   0.00000000000
0.6000  0.64350110879   0.64350110879   0.00000000000
0.6400  0.69449826563   0.69449826563   0.00000000000
0.6800  0.74776263466   0.74776263466   0.00000000001
0.7200  0.80380231893   0.80380231893   0.00000000041
0.7600  0.86331311490   0.86331311502   0.00000001284
0.8000  0.92729521476   0.92729521800   0.00000034926
0.8400  0.99728313874   0.99728322237   0.00000838601
0.8800  1.07586022993   1.07586220045   0.00018315786
0.9200  1.16803598923   1.16808048521   0.00380932542
0.9600  1.28592341946   1.28700221759   0.08382255368

Series arcsin Versus C++ asin
# Terms = 40
x       fx              sx              error
0.0000  0.00000000000   0.00000000000   0.00000000000
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```
0.0400   0.04001067435    0.04001067435    0.00000000000
0.0800   0.08008558003    0.08008558003    0.00000000000
0.1200   0.12028988239    0.12028988239    0.00000000000
0.1600   0.16069065295    0.16069065295    0.00000000000
0.2000   0.20135792079    0.20135792079    0.00000000000
0.2400   0.24236585104    0.24236585104    0.00000000000
0.2800   0.28379410921    0.28379410921    0.00000000000
0.3200   0.32572948729    0.32572948729    0.00000000000
0.3600   0.36826789344    0.36826789344    0.00000000000
0.4000   0.41151684607    0.41151684607    0.00000000000
0.4400   0.45559867340    0.45559867340    0.00000000000
0.4800   0.50065471240    0.50065471240    0.00000000000
0.5200   0.54685095070    0.54685095070    0.00000000000
0.5600   0.59438580000    0.59438580000    0.00000000000
0.6000   0.64350110879    0.64350110879    0.00000000000
0.6400   0.69449826563    0.69449826563    0.00000000000
0.6800   0.74776263466    0.74776263466    0.00000000000
0.7200   0.80380231893    0.80380231893    0.00000000000
0.7600   0.86331311502    0.86331311502    0.00000000004
0.8000   0.92729521798    0.92729521800    0.00000000270
0.8400   0.99728322064    0.99728322237    0.00000017316
0.8800   1.07586209653    1.07586220045    0.00000966005
0.9200   1.16807470429    1.16808048521    0.00049490826
0.9600   1.28666504829    1.28700221759    0.02619803573


Series arcsin Versus C++ asin
# Terms = 50
x        fx               sx               error
0.0000   0.00000000000    0.00000000000    0.00000000000
0.0400   0.04001067435    0.04001067435    0.00000000000
0.0800   0.08008558003    0.08008558003    0.00000000000
0.1200   0.12028988239    0.12028988239    0.00000000000
0.1600   0.16069065295    0.16069065295    0.00000000000
0.2000   0.20135792079    0.20135792079    0.00000000000
0.2400   0.24236585104    0.24236585104    0.00000000000
0.2800   0.28379410921    0.28379410921    0.00000000000
0.3200   0.32572948729    0.32572948729    0.00000000000
0.3600   0.36826789344    0.36826789344    0.00000000000
0.4000   0.41151684607    0.41151684607    0.00000000000
0.4400   0.45559867340    0.45559867340    0.00000000000
0.4800   0.50065471240    0.50065471240    0.00000000000
0.5200   0.54685095070    0.54685095070    0.00000000000
0.5600   0.59438580000    0.59438580000    0.00000000000
0.6000   0.64350110879    0.64350110879    0.00000000000
0.6400   0.69449826563    0.69449826563    0.00000000000
0.6800   0.74776263466    0.74776263466    0.00000000000
0.7200   0.80380231893    0.80380231893    0.00000000000
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0.7600   0.86331311502      0.86331311502      0.00000000000
0.8000   0.92729521800      0.92729521800      0.00000000002
0.8400   0.99728322233      0.99728322237      0.00000000388
0.8800   1.07586219452      1.07586220045      0.00000055189
0.9200   1.16807967486      1.16808048521      0.00006937496
0.9600   1.28688939111      1.28700221759      0.00876661060


Series arcsin Versus C++ asin
# Terms = 60
x        fx                 sx                 error
0.0000   0.00000000000      0.00000000000      0.00000000000
0.0400   0.04001067435      0.04001067435      0.00000000000
0.0800   0.08008558003      0.08008558003      0.00000000000
0.1200   0.12028988239      0.12028988239      0.00000000000
0.1600   0.16069065295      0.16069065295      0.00000000000
0.2000   0.20135792079      0.20135792079      0.00000000000
0.2400   0.24236585104      0.24236585104      0.00000000000
0.2800   0.28379410921      0.28379410921      0.00000000000
0.3200   0.32572948729      0.32572948729      0.00000000000
0.3600   0.36826789344      0.36826789344      0.00000000000
0.4000   0.41151684607      0.41151684607      0.00000000000
0.4400   0.45559867340      0.45559867340      0.00000000000
0.4800   0.50065471240      0.50065471240      0.00000000000
0.5200   0.54685095070      0.54685095070      0.00000000000
0.5600   0.59438580000      0.59438580000      0.00000000000
0.6000   0.64350110879      0.64350110879      0.00000000000
0.6400   0.69449826563      0.69449826563      0.00000000000
0.6800   0.74776263466      0.74776263466      0.00000000000
0.7200   0.80380231893      0.80380231893      0.00000000000
0.7600   0.86331311502      0.86331311502      0.00000000000
0.8000   0.92729521800      0.92729521800      0.00000000000
0.8400   0.99728322237      0.99728322237      0.00000000009
0.8800   1.07586220010      1.07586220045      0.00000003322
0.9200   1.16808036580      1.16808048521      0.00001022297
0.9600   1.28696271461      1.28700221759      0.00306937871


Series arcsin Versus C++ asin
# Terms = 70
x        fx                 sx                 error
0.0000   0.00000000000      0.00000000000      0.00000000000
0.0400   0.04001067435      0.04001067435      0.00000000000
0.0800   0.08008558003      0.08008558003      0.00000000000
0.1200   0.12028988239      0.12028988239      0.00000000000
0.1600   0.16069065295      0.16069065295      0.00000000000
0.2000   0.20135792079      0.20135792079      0.00000000000
0.2400   0.24236585104      0.24236585104      0.00000000000
0.2800   0.28379410921      0.28379410921      0.00000000000
```

```
0.3200   0.32572948729   0.32572948729   0.00000000000
0.3600   0.36826789344   0.36826789344   0.00000000000
0.4000   0.41151684607   0.41151684607   0.00000000000
0.4400   0.45559867340   0.45559867340   0.00000000000
0.4800   0.50065471240   0.50065471240   0.00000000000
0.5200   0.54685095070   0.54685095070   0.00000000000
0.5600   0.59438580000   0.59438580000   0.00000000000
0.6000   0.64350110879   0.64350110879   0.00000000000
0.6400   0.69449826563   0.69449826563   0.00000000000
0.6800   0.74776263466   0.74776263466   0.00000000000
0.7200   0.80380231893   0.80380231893   0.00000000000
0.7600   0.86331311502   0.86331311502   0.00000000000
0.8000   0.92729521800   0.92729521800   0.00000000000
0.8400   0.99728322237   0.99728322237   0.00000000000
0.8800   1.07586220043   1.07586220045   0.00000000208
0.9200   1.16808046698   1.16808048521   0.00000156078
0.9600   1.28698793226   1.28700221759   0.00110996898


Series arcsin Versus C++ asin
# Terms = 80
x        fx              sx              error
0.0000   0.00000000000   0.00000000000   0.00000000000
0.0400   0.04001067435   0.04001067435   0.00000000000
0.0800   0.08008558003   0.08008558003   0.00000000000
0.1200   0.12028988239   0.12028988239   0.00000000000
0.1600   0.16069065295   0.16069065295   0.00000000000
0.2000   0.20135792079   0.20135792079   0.00000000000
0.2400   0.24236585104   0.24236585104   0.00000000000
0.2800   0.28379410921   0.28379410921   0.00000000000
0.3200   0.32572948729   0.32572948729   0.00000000000
0.3600   0.36826789344   0.36826789344   0.00000000000
0.4000   0.41151684607   0.41151684607   0.00000000000
0.4400   0.45559867340   0.45559867340   0.00000000000
0.4800   0.50065471240   0.50065471240   0.00000000000
0.5200   0.54685095070   0.54685095070   0.00000000000
0.5600   0.59438580000   0.59438580000   0.00000000000
0.6000   0.64350110879   0.64350110879   0.00000000000
0.6400   0.69449826563   0.69449826563   0.00000000000
0.6800   0.74776263466   0.74776263466   0.00000000000
0.7200   0.80380231893   0.80380231893   0.00000000000
0.7600   0.86331311502   0.86331311502   0.00000000000
0.8000   0.92729521800   0.92729521800   0.00000000000
0.8400   0.99728322237   0.99728322237   0.00000000000
0.8800   1.07586220045   1.07586220045   0.00000000013
0.9200   1.16808048236   1.16808048521   0.00000024468
0.9600   1.28699692451   1.28700221759   0.00041127183
```

```
Series arcsin Versus C++ asin
# Terms = 90
x          fx                  sx                   error
0.0000       -nan(ind)        0.00000000000      0.00000000000
0.0400       -nan(ind)        0.04001067435      nan
0.0800       -nan(ind)        0.08008558003      nan
0.1200       -nan(ind)        0.12028988239      nan
0.1600       -nan(ind)        0.16069065295      nan
0.2000       -nan(ind)        0.20135792079      nan
0.2400       -nan(ind)        0.24236585104      nan
0.2800       -nan(ind)        0.28379410921      nan
0.3200       -nan(ind)        0.32572948729      nan
0.3600       -nan(ind)        0.36826789344      nan
0.4000       -nan(ind)        0.41151684607      nan
0.4400       -nan(ind)        0.45559867340      nan
0.4800       -nan(ind)        0.50065471240      nan
0.5200       -nan(ind)        0.54685095070      nan
0.5600       -nan(ind)        0.59438580000      nan
0.6000       -nan(ind)        0.64350110879      nan
0.6400       -nan(ind)        0.69449826563      nan
0.6800       -nan(ind)        0.74776263466      nan
0.7200       -nan(ind)        0.80380231893      nan
0.7600       -nan(ind)        0.86331311502      nan
0.8000       -nan(ind)        0.92729521800      nan
0.8400       -nan(ind)        0.99728322237      nan
0.8800       -nan(ind)        1.07586220045      nan
0.9200       -nan(ind)        1.16808048521      nan
0.9600       -nan(ind)        1.28700221759      nan
```

So, the power series bombs out when using 90 terms. Now onto the arctangent function.

```
Series arctan Versus C++ atan
# Terms = 10
x          fx                  sx                   error
0.0000   0.00000000000      0.00000000000      0.00000000000
0.0400   0.03997868712      0.03997868712      0.00000000000
0.0800   0.07982998571      0.07982998571      0.00000000000
0.1200   0.11942892602      0.11942892602      0.00000000000
0.1600   0.15865526219      0.15865526219      0.00000000000
0.2000   0.19739555985      0.19739555985      0.00000000000
0.2400   0.23554498072      0.23554498072      0.00000000000
0.2800   0.27300870309      0.27300870309      0.00000000004
0.3200   0.30970294454      0.30970294454      0.00000000057
0.3600   0.34555558056      0.34555558058      0.00000000593
0.4000   0.38050637693      0.38050637711      0.00000004803
0.4400   0.41450687327      0.41450687458      0.00000031779
```

```
0.4800    0.44751996719    0.44751997516    0.00000177918
0.5200    0.47951925048    0.47951929199    0.00000865668
0.5600    0.51048813113    0.51048832192    0.00003737319
0.6000    0.54041871369    0.54041950027    0.00014554933
0.6400    0.56931024102    0.56931319110    0.00051818231
0.6800    0.59716647654    0.59717665809    0.00170494901
0.7200    0.62399040747    0.62402305298    0.00523145776
0.7600    0.64977242468    0.64987044941    0.01508373497
0.8000    0.67446342170    0.67474094222    0.04112993758
0.8400    0.69791471899    0.69865982472    0.10664785677
0.8800    0.71974819811    0.72165485086    0.26420563119
0.9200    0.73908537282    0.74375558430    0.62792287972
0.9600    0.75400140094    0.76499283271    1.43680192868

Series arctan Versus C++ atan
# Terms = 30
x         fx                sx                error
0.0000    0.00000000000    0.00000000000    0.00000000000
0.0400    0.03997868712    0.03997868712    0.00000000000
0.0800    0.07982998571    0.07982998571    0.00000000000
0.1200    0.11942892602    0.11942892602    0.00000000000
0.1600    0.15865526219    0.15865526219    0.00000000000
0.2000    0.19739555985    0.19739555985    0.00000000000
0.2400    0.23554498072    0.23554498072    0.00000000000
0.2800    0.27300870309    0.27300870309    0.00000000000
0.3200    0.30970294454    0.30970294454    0.00000000000
0.3600    0.34555558058    0.34555558058    0.00000000000
0.4000    0.38050637711    0.38050637711    0.00000000000
0.4400    0.41450687458    0.41450687458    0.00000000000
0.4800    0.44751997516    0.44751997516    0.00000000000
0.5200    0.47951929199    0.47951929199    0.00000000000
0.5600    0.51048832192    0.51048832192    0.00000000000
0.6000    0.54041950027    0.54041950027    0.00000000000
0.6400    0.56931319110    0.56931319110    0.00000000000
0.6800    0.59717665809    0.59717665809    0.00000000012
0.7200    0.62402305296    0.62402305298    0.00000000347
0.7600    0.64987044885    0.64987044941    0.00000008682
0.8000    0.67474092981    0.67474094222    0.00000183932
0.8400    0.69865959049    0.69865982472    0.00003352580
0.8800    0.72165100315    0.72165485086    0.00053317998
0.9200    0.74369988372    0.74375558430    0.00748909720
0.9600    0.76427451628    0.76499283271    0.09389845200

Series arctan Versus C++ atan
# Terms = 50
x         fx                sx                error
0.0000    0.00000000000    0.00000000000    0.00000000000
```

0.0400	0.03997868712	0.03997868712	0.00000000000
0.0800	0.07982998571	0.07982998571	0.00000000000
0.1200	0.11942892602	0.11942892602	0.00000000000
0.1600	0.15865526219	0.15865526219	0.00000000000
0.2000	0.19739555985	0.19739555985	0.00000000000
0.2400	0.23554498072	0.23554498072	0.00000000000
0.2800	0.27300870309	0.27300870309	0.00000000000
0.3200	0.30970294454	0.30970294454	0.00000000000
0.3600	0.34555558058	0.34555558058	0.00000000000
0.4000	0.38050637711	0.38050637711	0.00000000000
0.4400	0.41450687458	0.41450687458	0.00000000000
0.4800	0.44751997516	0.44751997516	0.00000000000
0.5200	0.47951929199	0.47951929199	0.00000000000
0.5600	0.51048832192	0.51048832192	0.00000000000
0.6000	0.54041950027	0.54041950027	0.00000000000
0.6400	0.56931319110	0.56931319110	0.00000000000
0.6800	0.59717665809	0.59717665809	0.00000000000
0.7200	0.62402305298	0.62402305298	0.00000000000
0.7600	0.64987044941	0.64987044941	0.00000000000
0.8000	0.67474094222	0.67474094222	0.00000000015
0.8400	0.69865982459	0.69865982472	0.00000001885
0.8800	0.72165483696	0.72165485086	0.00000192652
0.9200	0.74375439349	0.74375558430	0.00016010704
0.9600	0.76490859411	0.76499283271	0.01101168452