Appendix A

Computation of terminating series for the ℓ-H function

The ℓ-H function introduced in Chapter 2 which represents a rapidly convergent power series. This is verified by the following computation (executed in *Maple*) just for the first 20 terms!!!
(`https://drive.google.com/open?id=0Bwly1qnYQNxZT0MxLVdhXzFydEU`)

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> # \ell-Hypergeometric function with r=s=p=1; \ell=$\frac{1}{2}$; $a=\frac{1}{3}$, $b=\frac{1}{4}$; $c=2$

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$$> H\left(\frac{1}{3}, \frac{1}{4}, \left(\frac{1}{2}, 2\right), (x)\right) := \left(\sum_{n=0}^{20} \frac{\Gamma\left(n+\frac{1}{3}\right)}{\Gamma\left(\frac{1}{3}\right)} \cdot \frac{\Gamma\left(\frac{1}{4}\right)}{\Gamma\left(\frac{1}{4}+n\right)} \cdot \frac{\Gamma^{\frac{1}{2}.n}(2)}{\Gamma^{\frac{1}{2}.n}(2+n)} \cdot \frac{x^n}{n!}\right)$$

$$H\left(\frac{1}{3}, \frac{1}{4}, \frac{1}{2}, 2, x\right) := 1 + \frac{2}{3}\sqrt{2}\,x + \frac{16}{135}x^2 + \frac{14}{32805}\sqrt{24}\,x^3 + \frac{28}{6396975}x^4 \tag{1}$$
$$+ \frac{7}{203276182500}\sqrt{720}\,x^5 + \frac{8}{470635181533125}x^6$$
$$+ \frac{19}{1593984883630910400000000}\sqrt{40320}\,x^7 + \frac{209}{9098577294707090726928000000}x^8$$
$$+ \frac{19}{2674370300249680357219982438400000000000}\sqrt{3628800}\,x^9$$
$$+ \frac{19}{426864386125283492003397575689555200000000000000}x^{10}$$
$$+ \frac{589}{17209605782346834897525091200668219678032322887680000000000000000}$$
$$\sqrt{479001600}\,x^{11}$$
$$+ \frac{589}{98948027738402694826410929743966171606296838100263895040000000000000000}$$
$$x^{12} + 589/$$
$$838653724303475195037426755964836735078275183168103068642059397204279296 00\backslash$$
$$000000000000000\sqrt{87178291200}\,x^{13} + 589/$$
$$1993547879484904667941061159104925787883610400273591690016371760328368 7178\backslash$$
$$24000000000000000000000000\,x^{14} + 1333/$$
$$37788523240943878001682677362117340561977894791452986453841656213856940006\backslash$$
$$53377455264593923276800000000000000000000000000000000\sqrt{20922789888000}\,x^{15}$$
$$+ 30659/$$
$$96478907418764143577110097849430778118167522184451552725283277911264975780\backslash$$

$985095321957706603957965771767808000000000000000000000000000000\, x^{16}$
$+ 30659/$
$1151279838092150122999751253946706594637242072585652013324181833339241449 0\backslash$
$489505527097559975170808916563595372056441919078385319936000000000000000000\backslash$
$00000000000000\, \sqrt{6402373705728000}\, x^{17} + 1333/$
$2893443372761557601756745593421559829345940307363767220706205188049061401 7\backslash$
$728115785888058634001521467043613763730304570077332200268872453980160000000\backslash$
$0000000000000000000000000\, x^{18} + 1333/$
$6816863535355808517696860037372374832013765061160820518237628646132652803 6\backslash$
$774583986193557932522601536084990219144454789920875336950530907447445796 31\backslash$
$59151381053440000000000000000000000000000000000000000000$
$\sqrt{2432902008176640000}\, x^{19} + 1333/$
$2264287338596573154455082858807148524740747284051814237702696942540138868 9\backslash$
$933676526669872639237712938633605567139915835103757167786908784147486349 56\backslash$
$441415439922163841765474304000000000000000000000000000000000000000000000\, x^{20}$

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Appendix B

The graphs of ℓ-H exponential, trigonometric and hyperbolic functions

The following graphs show the comparison of ℓ-H exponential, ℓ-H trigonometric and ℓ-H hyperbolic functions with the classical exponential, trigonometric and hyperbolic functions respectively.
(https://drive.google.com/open?id=0Bwly1qnYQNxZSWxldEJ1YndLbVU)

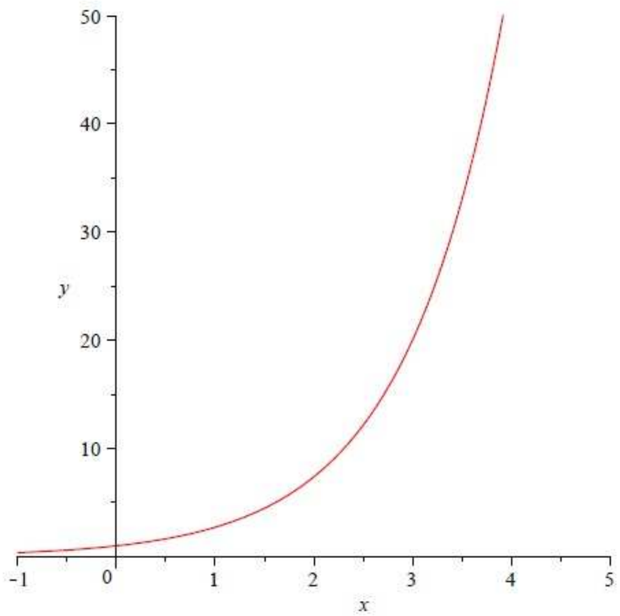

FIGURE B.1: Graph of e^x

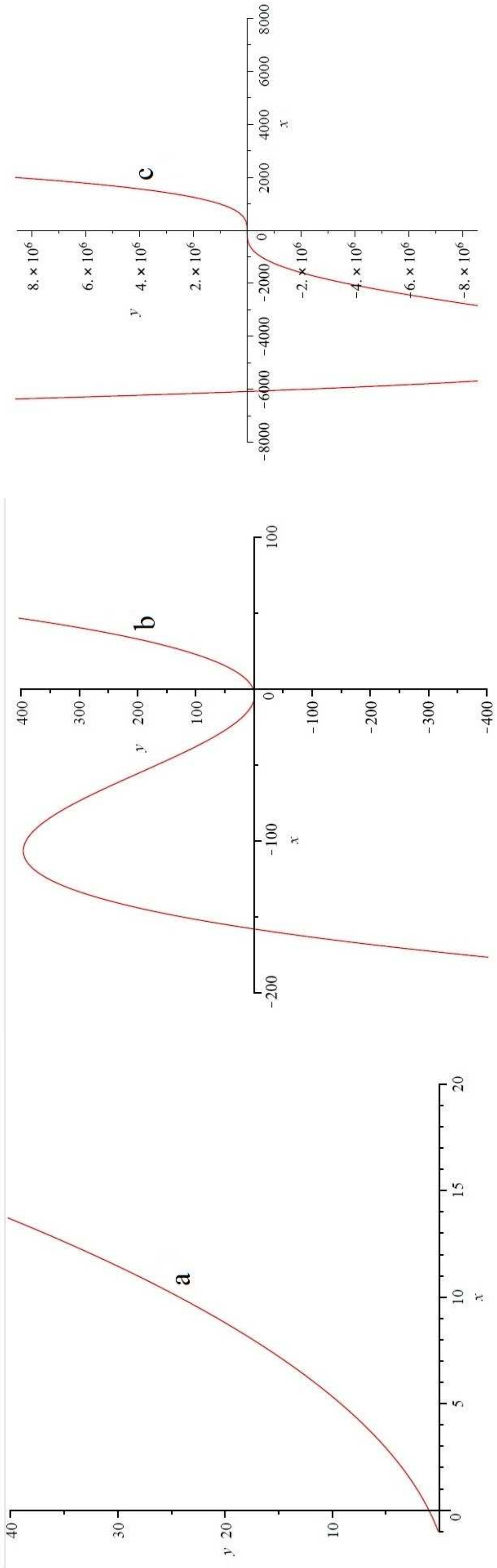

FIGURE B.2: a,b,c: Graphs of $e_H^1(x)$ with different scales

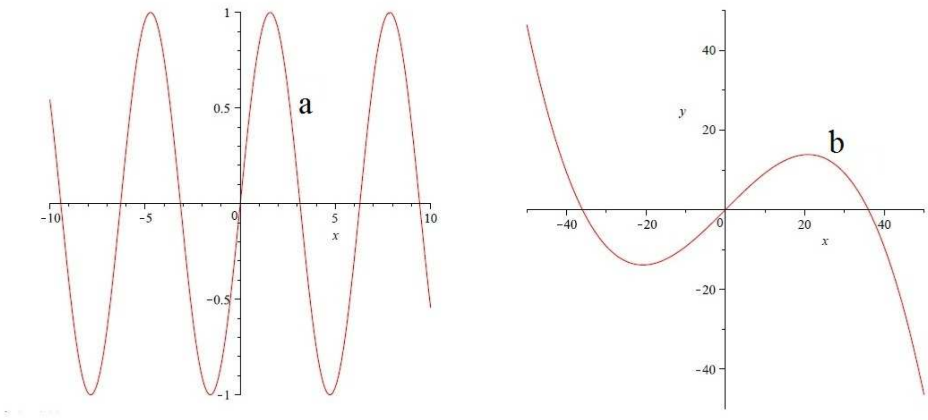

FIGURE B.3: a: Graph of $\sin(x)$ and b: Graph of $\sin_H^1(x)$

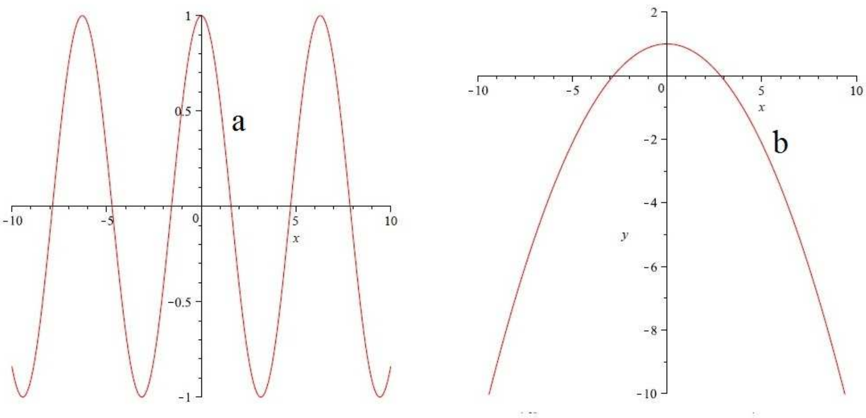

FIGURE B.4: a: Graph of $\cos(x)$ and b: Graph of $\cos_H^1(x)$

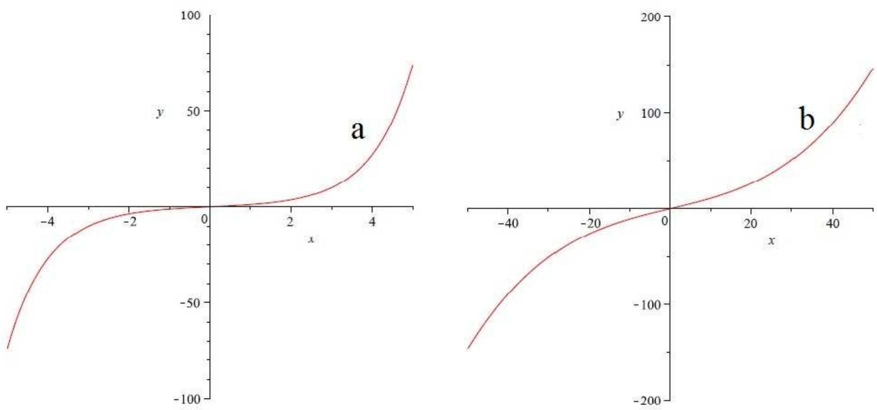

FIGURE B.5: a: Graph of $\sinh(x)$ and b: Graph of $\sinh_H^1(x)$

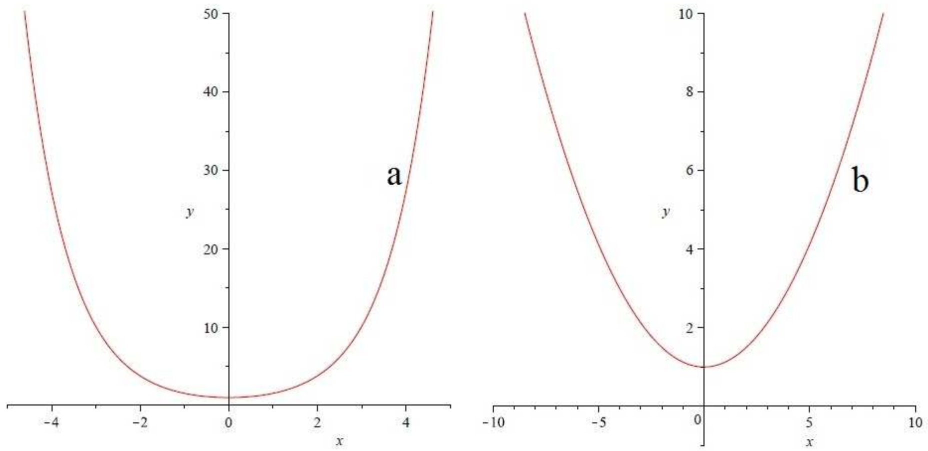

FIGURE B.6: a: Graph of $\cosh(x)$ and b: Graph of $\cosh^1_H(x)$

Appendix C

The graphs of ℓ-H Bessel functions

The following are the graphs of the ℓ-H Bessel functions of different order with different scales compared with the classical Bessel function.
(https://drive.google.com/open?id=0Bwly1qnYQNxZcy0tVndpd0s2YUk)

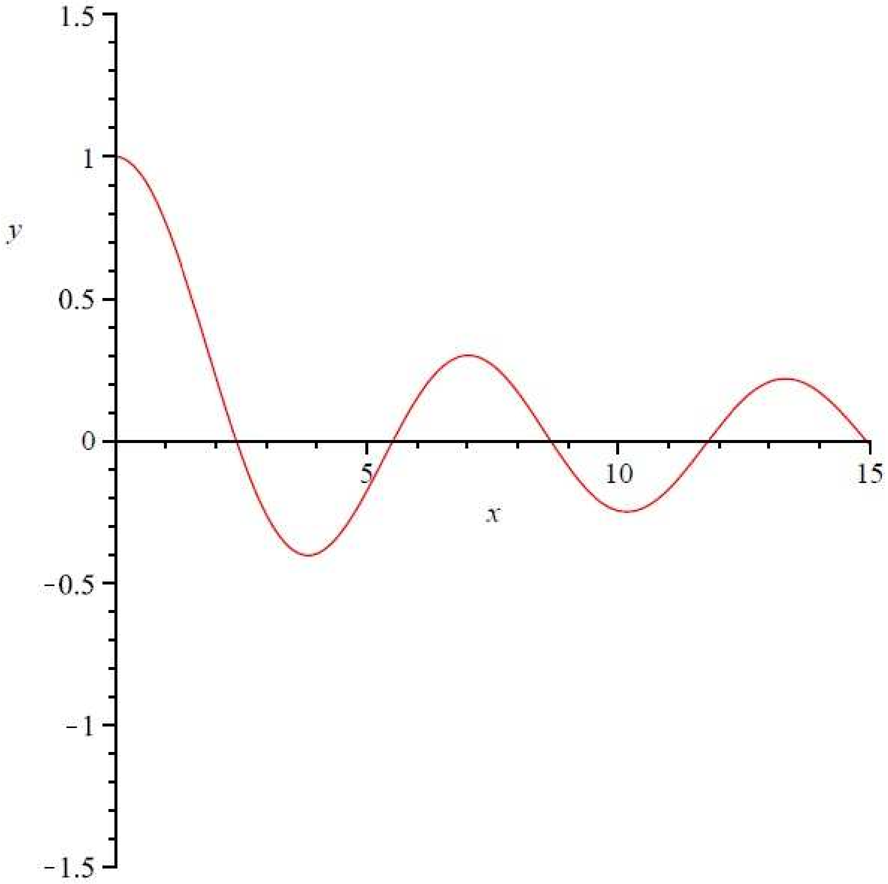

FIGURE C.1: Graph of $J_0(x)$

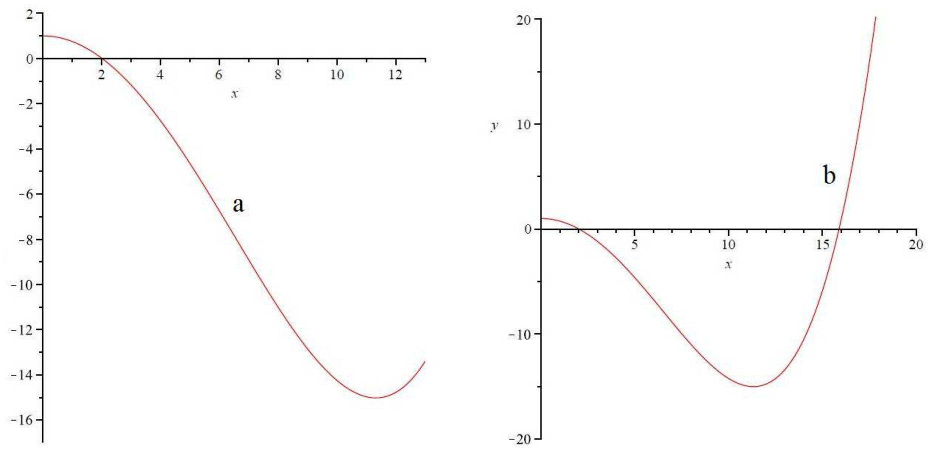

FIGURE C.2: a,b: Graphs of $J^1_{0,H}(x)$ with different scales

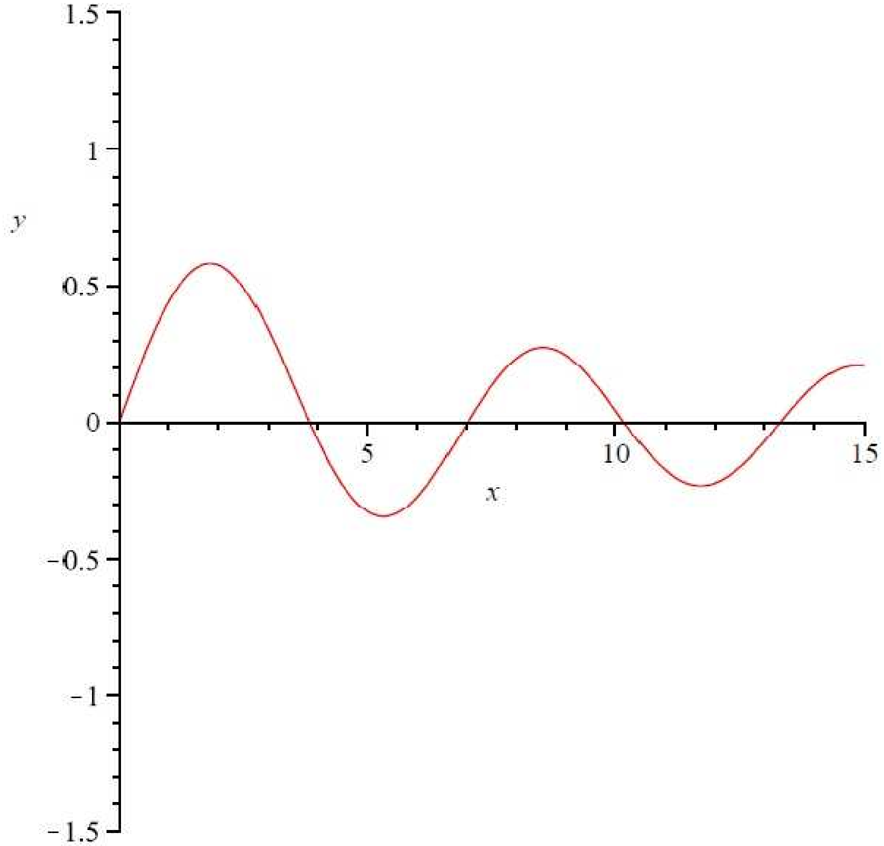

FIGURE C.3: Graph of $J_1(x)$

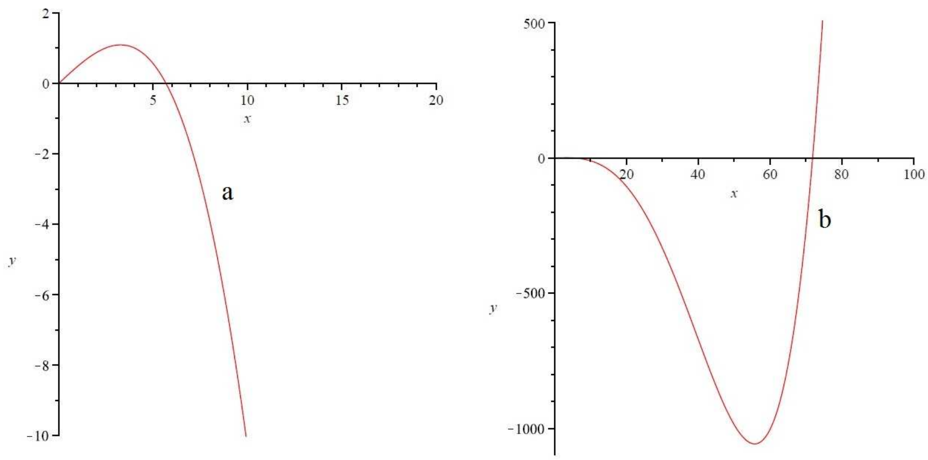

FIGURE C.4: a,b: Graphs of $J^1_{1,H}(x)$ with different scales

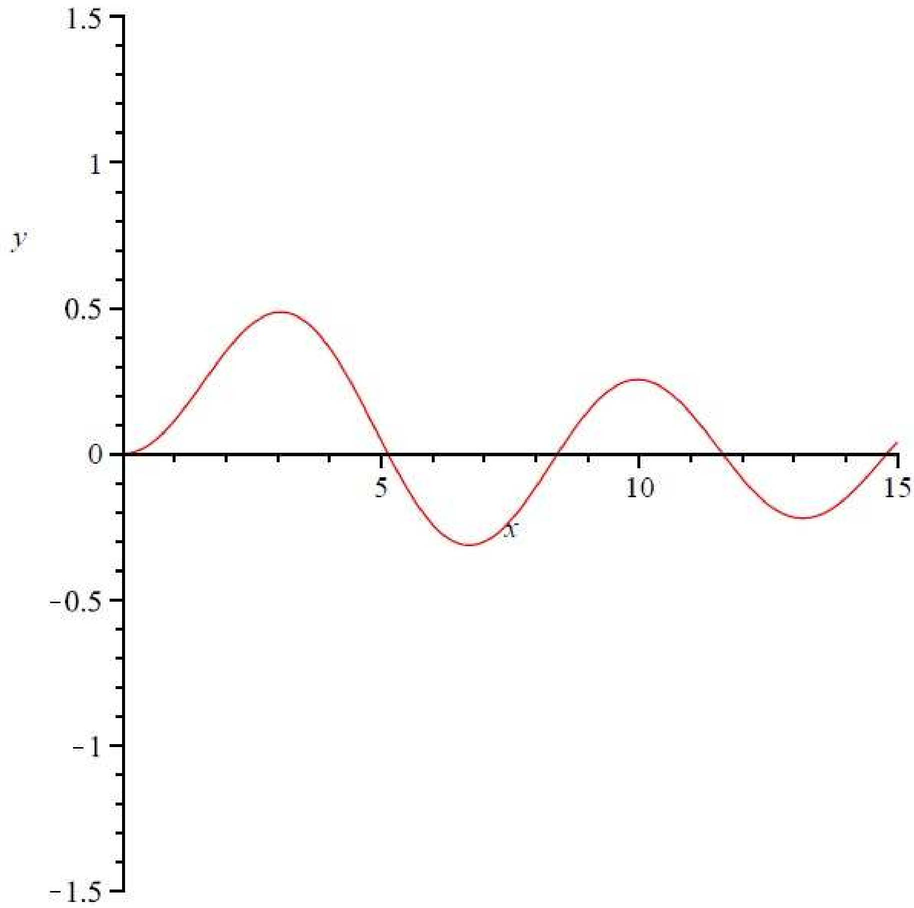

FIGURE C.5: Graph of $J_2(x)$

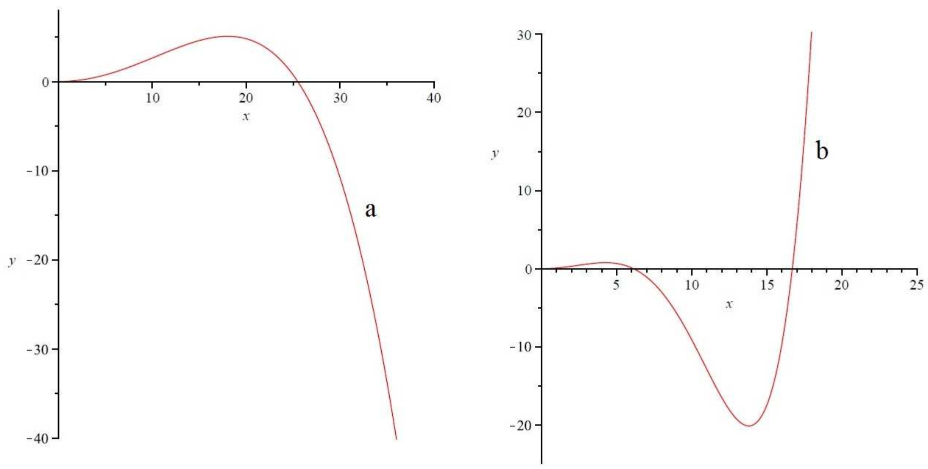

FIGURE C.6: a,b: Graphs of $J^{1}_{2,H}(x)$, $J^{\frac{1}{4}}_{2,H}(x)$ with different scales

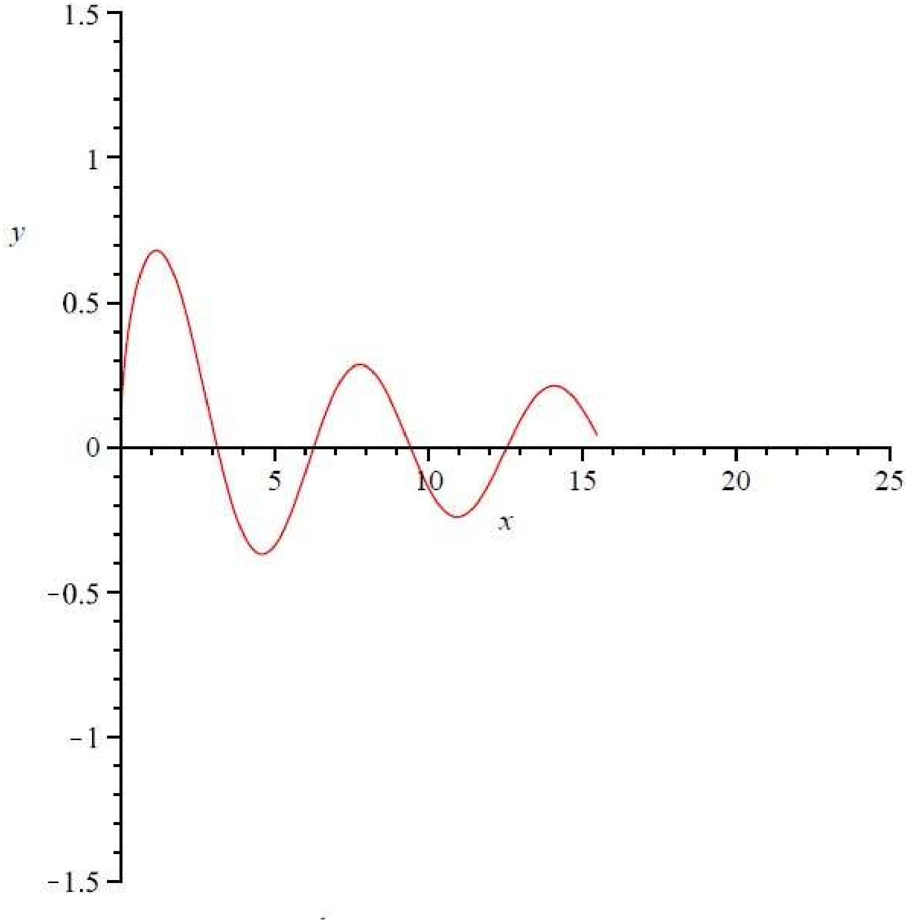

FIGURE C.7: Graph of $J_{\frac{1}{2}}(x)$

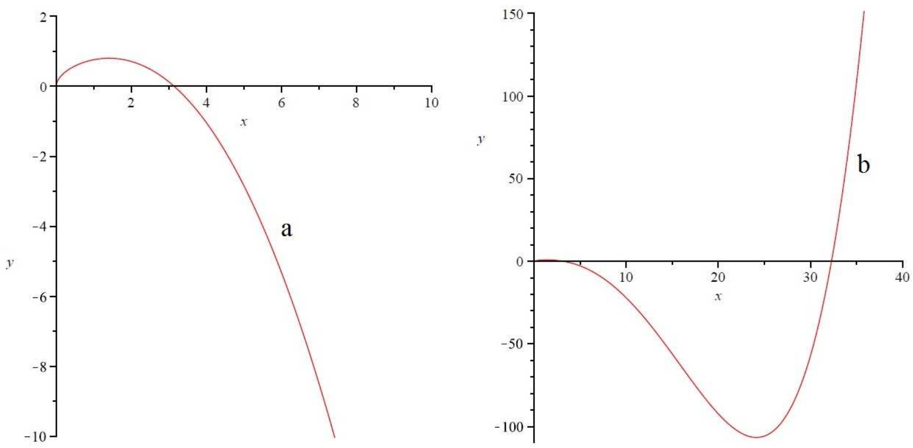

FIGURE C.8: a,b: Graphs of $J^{1}_{\frac{1}{2},H}(x)$ with different scales