

Abraham Cepeda

BUID: 5818

Table 1: Newton's Method

function $f(x)$	$f(x_0=3)$	x_1	$f(x_1)$	x_2	$f(x_2)$	x_3	$f(x_3)$
x^2-5	4	2.33	0.43	2.24	0.02	2.24	0.02
x^3-5	22	2.19	5.5	1.81	0.93	1.72	0.09
$\sqrt{x}-1.5$	0.23	2.2	-0.02	2.25	0.0	2.25	0.0
e^x-2	18.09	2.1	6.17	1.34	1.82	0.86	0.36
$2^x-0.5$	7.5	1.65	2.64	0.44	0.86	0.47	0.22
$\log(x)-1$	0.1	2.7	-0.01	2.72	0.0	2.77	0.0
$\sin(x)-0.5$	-0.36	2.64	-0.02	2.62	0.0	2.62	0.0
$\cos(x)-0.5$	-1.49	-7.86	-0.21	-7.34	-0.01	-7.33	0.0

Table 2: Secant method

function $f(x)$	$f(x_0=3)$	x_1	$f(x_1)$	x_2	$f(x_2)$	x_3	$f(x_3)$
x^2-5	4	1.67	-2.21	2.14	-0.42	2.25	0.06
x^3-5	22	0.56	-4.82	1.0	-4.0	3.13	25.66
$\sqrt{x}-1.5$	0.23	2.6	0.11	2.22	-0.01	2.25	0.0
e^x-2	18.09	0.16	-0.83	0.28	-0.68	0.82	0.27
$2^x-0.5$	7.5	-0.21	0.36	-0.37	0.27	-0.85	0.05
$\log(x)-1$	0.1	undef	undef	undef	undef	undef	undefined
$\sin(x)-0.5$	-0.36	10.63	-1.43	0.45	-0.07	-0.03	-0.53
$\cos(x)-0.5$	-1.49	0.75	0.23	1.05	0.0	1.05	0.0

Table 3: Bisection Method

function $f(x)$	$f(x_0=3)$	x_1	$f(x_1)$	x_2	$f(x_2)$	x_3	$f(x_3)$
x^2-5	4	0.0	-5	-1.5	-2.75	-2.25	0.06
x^3-5	22	0.0	-5	1.5	-1.62	2.25	6.39
$\sqrt{x}-1.5$	0.23	0.0	-1.5	1.5	-0.28	2.25	0.0
e^x-2	18.09	0.0	-1	1.5	2.48	0.75	0.12
$2^x-0.5$	7.5	0.0	0.5	-1.5	-0.15	-0.75	0.09
$\log(x)-1$	0.1	0.0	-inf	1.5	-0.59	2.25	-0.19
$\sin(x)-0.5$	-0.36	0.0	-0.5	1.5	0.5	0.75	0.18
$\cos(x)-0.5$	-1.49	0.0	0.5	-1.5	-0.43	-0.75	0.23

Table 4: A Comparison of Root Finding

function $f(x)$	root r	Newton x_3	Newton E	Secant x_3	Secant E	Bisection x_3	Bisection E
$x^2 - 5$	-2.24, 2.24	2.24	0.1%	2.25	0.45%	-2.25	0.45%
$x^3 - 5$	1.71	1.72	0.58%	3.13	83.01%	2.25	31.58%
$\sqrt{x} - 1.5$	2.25	2.25	0%	2.25	0%	2.25	0%
$e^x - 2$	0.69	0.86	24.64%	0.82	18.84%	0.75	8.7%
$2^x - 0.5$	-1	-0.47	53%	-0.85	15%	-0.75	25%
$\log(x) - 1$	10	2.72	72.8%	undef	undef	2.25	77.5%
$\sin(x) - 0.5$	0.52, 2.62	2.62	0%	-0.03	105.77%	0.75	44.23%
$\cos(x) - 0.5$	1.05, 5.24	-7.33	0%	1.05	0%	-0.75	28.57%

-7.33, -1.05

In general, the Newton-Raphson method was the most accurate. The secant method did not work with the logarithmic function.