$f(M)$ table

Andrew Ning

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Recall that a mass balance in a nozzle gives

$$\left(\frac{P_0 A f(M)}{\sqrt{T_0}}\right)_1 = \left(\frac{P_0 A f(M)}{\sqrt{T_0}}\right)_2 \tag{1}$$

where

$$f(M) = M\left[\frac{2}{\gamma+1}\left(1+\frac{\gamma-1}{2}M^2\right)\right]^{\frac{-(\gamma+1)}{2(\gamma-1)}} \tag{2}$$

We cannot explicitly invert $f(M)$ to solve for M. Normally we use a root-finding method, but I've also tabulated below for your convenience. **Note that this table is for air ($\gamma = 1.4$).** You would need a separate table for different gases. Recall that there is a subsonic root and a supersonic root.

Table 1: Inverse solution of $f(M)$ to solve for M (for air only, $\gamma = 1.4$).

$f(M)$	M (sub)	M (super)	$f(M)$	M (sub)	M (super)	$f(M)$	M (sub)	M (super)
0.01	0.0058	6.9363	0.41	0.2460	2.4161	0.81	0.5640	1.5802
0.02	0.0116	5.9138	0.42	0.2525	2.3899	0.82	0.5751	1.5606
0.03	0.0174	5.3674	0.43	0.2590	2.3643	0.83	0.5864	1.5408
0.04	0.0232	5.0000	0.44	0.2656	2.3392	0.84	0.5981	1.5208
0.05	0.0289	4.7255	0.45	0.2722	2.3145	0.85	0.6102	1.5004
0.06	0.0347	4.5074	0.46	0.2788	2.2903	0.86	0.6227	1.4798
0.07	0.0405	4.3271	0.47	0.2855	2.2664	0.87	0.6357	1.4588
0.08	0.0464	4.1737	0.48	0.2923	2.2430	0.88	0.6492	1.4374
0.09	0.0522	4.0403	0.49	0.2991	2.2199	0.89	0.6633	1.4155
0.10	0.0580	3.9226	0.50	0.3059	2.1972	0.90	0.6782	1.3930
0.11	0.0638	3.8171	0.51	0.3128	2.1748	0.91	0.6939	1.3698
0.12	0.0696	3.7217	0.52	0.3198	2.1527	0.92	0.7105	1.3457
0.13	0.0755	3.6346	0.53	0.3268	2.1309	0.93	0.7283	1.3206
0.14	0.0813	3.5545	0.54	0.3339	2.1094	0.94	0.7475	1.2941
0.15	0.0872	3.4804	0.55	0.3410	2.0881	0.95	0.7685	1.2659
0.16	0.0931	3.4114	0.56	0.3482	2.0670	0.96	0.7919	1.2354
0.17	0.0990	3.3468	0.57	0.3555	2.0462	0.97	0.8187	1.2017
0.18	0.1049	3.2861	0.58	0.3629	2.0256	0.98	0.8509	1.1626
0.19	0.1108	3.2289	0.59	0.3703	2.0053	0.99	0.8935	1.1132
0.20	0.1167	3.1748	0.60	0.3778	1.9850	1.00	1.0000	1.0000
0.21	0.1226	3.1234	0.61	0.3854	1.9650			
0.22	0.1286	3.0744	0.62	0.3931	1.9451			
0.23	0.1346	3.0277	0.63	0.4009	1.9254			
0.24	0.1405	2.9830	0.64	0.4088	1.9058			
0.25	0.1465	2.9402	0.65	0.4167	1.8863			
0.26	0.1526	2.8990	0.66	0.4248	1.8670			
0.27	0.1586	2.8594	0.67	0.4330	1.8477			
0.28	0.1647	2.8212	0.68	0.4413	1.8285			
0.29	0.1708	2.7843	0.69	0.4498	1.8094			
0.30	0.1769	2.7486	0.70	0.4583	1.7904			
0.31	0.1830	2.7141	0.71	0.4670	1.7713			
0.32	0.1892	2.6806	0.72	0.4759	1.7524			
0.33	0.1954	2.6481	0.73	0.4849	1.7334			
0.34	0.2016	2.6164	0.74	0.4941	1.7144			
0.35	0.2078	2.5857	0.75	0.5034	1.6955			
0.36	0.2141	2.5557	0.76	0.5130	1.6764			
0.37	0.2204	2.5264	0.77	0.5227	1.6574			
0.38	0.2268	2.4979	0.78	0.5327	1.6383			
0.39	0.2331	2.4700	0.79	0.5429	1.6190			
0.40	0.2395	2.4428	0.80	0.5533	1.5997			