

A Hewlett-Packard Software Summary
for the HP-85 Personal Computer

HP-85 Math Pac



Complex mathematical computations made easy.

Is your concern engineering, education, research and development, manufacturing, computer science, physics, chemistry or another discipline involving complex mathematics? Hewlett-Packard's HP-85 Math Pac can free you from much of the tedium of computation, allowing you to progress in your own work instead of expending valuable time writing numerical analysis routines.

The HP-85 Math Pac provides you quick access to commonly used mathematical routines from the fields of calculus, numerical analysis, linear systems, geometry and special functions. The Math Pac manual describes each program in the Pac and provides relevant equations, user instructions and example problems.

In addition, the HP-85 Computer has many easy-to-use features built in. It integrates CPU (central processing unit), memory, keyboard, graphics CRT, thermal printer and mass storage into one compact unit small enough to sit on your desk or worktable. Operator prompts and Special Function Key labels appear on the CRT so even less experienced operators can perform complex analyses quickly. The HP-85 puts easy-to-use computer power at your fingertips with no waiting.

A General Purpose Software Package

The HP-85 Math Pac has been designed for use in several disciplines. Because the format of the input and output has not been tailored or structured for any particular application, it can be used for many diverse applications involving complex calculations. Compare your applications with the features you'll find in the Math Pac:

- Coverage for disciplines that use simultaneous equations (matrices), solutions to $f(x)=0$ (root finder), numerical integration with equally or unequally spaced data, and differential equations.
- Standard Pac compatibility: Many of the routines are designed to complement programs in the Standard Pac shipped with every HP-85 Computer.
- Tape storage available for additional programs: The Math Pac tape cartridge has space for you to store additional programs for other calculations you need frequently.
- Extra memory expands program limits: Several Math Pac programs have specific upper limits that you can expand using the optional 16K-byte memory module.
- User-alterable programs: Detailed comments in the program documentation help you alter or personalize Math Pac programs you have loaded from the tape cartridge into the HP-85's memory.

Program Summary

Simultaneous Equations

This program solves the system of equations $AX=B$ using Gaussian elimination to ensure a high degree of accuracy. The program handles up to 25 equations — five more than the Standard Pac, which uses a different algorithm. Also included is an automatic bad-data check that detects most cases of illegal data entry. And you can quickly edit or correct data inputs without having to clear the entire problem.

Solution to $f(x)=0$ on an Interval

Given a first guess, this program will search for a real root of the equation $f(x)=0$, where you define the continuous, real-valued function $f(x)$ in program memory. (See Figure 1.) You can also specify error tolerances, step size and number of iterations for the search. The program uses the modified secant method, a technique that allows you to find roots relatively quickly and accurately. The modified secant method is especially useful when your function, $f(x)$, has periodic oscillations or other unusual behavior.

Integration with Equally

Spaced Points

Integration with Unequally

Spaced Points

These two programs approximate $\int_a^b f(x)dx$ where $f(x)$ is represented by discrete function values at equally or unequally spaced points. (See Figure 2.) Integration with equally spaced data uses Simpson's rule to fit a function through the data, then integrates the area under the curve. Using this routine, you can input up to 999 equally spaced points. Integration with unequally spaced data operates with up to 300 unequally spaced x values. A cubic spline function is fitted through the points, and the area under that curve is calculated. This method can also be used on equally spaced data.

Ordinary Differential Equations

This program uses the well-known, fourth-order, Runge-Kutta method for solving systems of first-order, ordinary differential equations. A higher-order differential equation may be solved by replacing it with a system of first-order equations. User inputs are the dimensions of the system (≤ 3), the limits of integration, the initial value vector, the maximum number of integration steps and the user-defined system of equations.

Chebyshev Polynomial

The Chebyshev polynomial program fits up to 450 points to a Chebyshev polynomial and performs interpolation on the polynomial.

Fourier Series for Equally Spaced Points Fourier Series for Unequally Spaced Points

These two programs create frequency domain representations from time domain data. The representations are computed using Fourier series coefficients that correspond to functions specified by the data. Up to 500 equally spaced points or up to 300 unequally spaced points can be entered.

Fast Fourier Transform

This program performs a fast Fourier transform on a set of up to 512 time-domain points. Inverse fast Fourier transforms can also be computed.

Complex Number Operations

These programs complement existing math functions in the HP-85. Calculations include:

- Hyperbolic sine, cosine, tangent and their inverses.
- Complex operations: addition, multiplication, division, $\ln z$, e^z , z^n , $z^{1/n}$.
- Complex polynomial evaluation.

Triangle Solutions

Given any three variables of any defined plane triangle, the other three variables and the area are computed.

Ordering Information

The complete HP-85 Math Pac is contained in a convenient molded binder and includes:

- A prerecorded cartridge containing the math programs.
- An instruction manual that describes the programs and gives detailed instructions and examples.

To order the HP-85 Math Pac, specify Part No. 00085-13005. For further information on the HP-85 Computer or the HP-85 Math Pac, contact your nearest Hewlett-Packard Sales Office or authorized HP-85 dealer. To locate the sales office or authorized dealer nearest you, please call 800/648-4711, ext. 1000 (Alaska and Hawaii excluded). In Nevada call 800/992-5710.

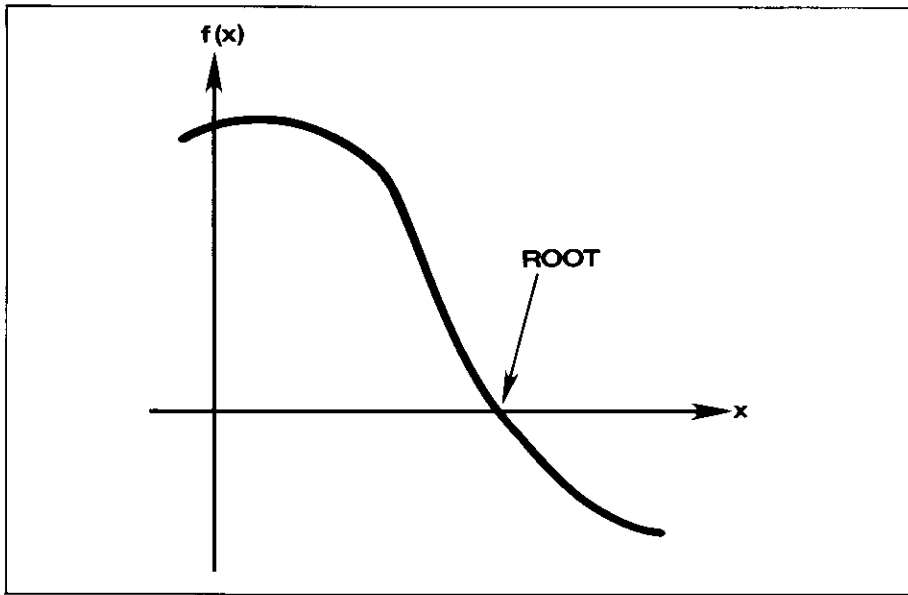


Figure 1. Solution to $f(x) = 0$ on an interval.

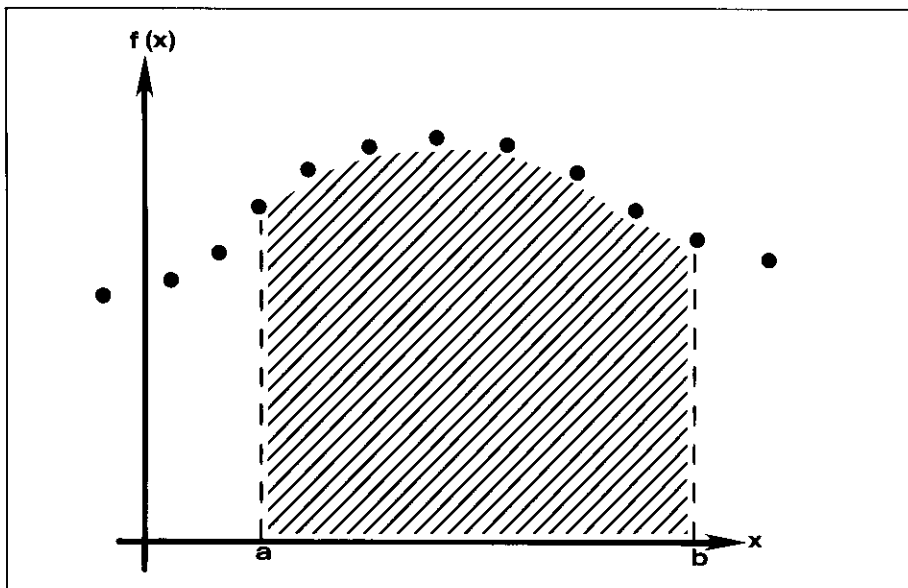


Figure 2. Integration with equally spaced data.

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