

FINDING A FUNCTION BY PRE-SET CONDITIONS V1.10

This program finds for a function $f(x)$ of n^{th} degree ($2 \leq n \leq 4$) given as $f(x) =$

$a \cdot x^n + b \cdot x^{n-1} + c \cdot x^{n-2} + \dots$ the numerical values of the unknown coefficients **a, b, c, ...** owing to pre-set conditions.

These conditions may be: a given point $P(x|y)$ as part of the graph of a function **f(x)**, extremum or tangent in x for **f'(x)**, point of inflexion in x as **f''(x)=0** or the integral **I(x) = fnInt(f(x), x_{lower}, x_{upper})** between two points of the graph. The quantity of the integral (area between x-axis and graph) is negative if situated in the 3rd and/or 4th quadrant !

Load **findfcn.8xp** to the calculator and press **prgm**. Then select **EXEC FINDFCN** and press **enter** and again **enter**. On the following prompt "DEGREE=" enter **2, 3** or **4** for the exponent n .

Now the program prompts $(n+1)$ -times for the input of X , Y and the key for the function type (**0** stands for input into the base function, **1** for 1st derivative of $f(x) = f'(x)$, **2** for **f''(x)**) or **3** for an input into the integral function **I(x)** of the unknown $f(x)$. In this case an additional input for x_{upper} (bound) has to be done, in which the former input for X is assumed to be x_{lower} (bound of the integral) and Y the area between the limits.

After all entries are done the result is given as list L_1 containing the numerical values **{a,b,c,...}**.

EXAMPLE:

The graph of a function of 3rd degree intersects the y -axis at $y=3.6$, has a point of inflection at $x=5/3$ and a maximum at $x=10/3$. The integral (area) within the interval $x=0$ and $x=6$ is 25.2 . Find the numerical form of $f(x)$.

Start **FINDFCN** and enter **3** for the degree.

The first indication made is: (0|3.6) point of $f(x)$. Thus the next input has to be:

$X=0$, $Y=3.6$, $F/F'/F''/I=0/1/2/3$: **0**

In a point of inflexion $f''(x)=0$ applies, so enter next:

$X=5/3$, $Y=0$, $F/F'/F''/I=0/1/2/3$: **2**

In $x=10/3$ the gradient of the tangent $f'(x)$ is 0 (extremum!), so the following entry is:

$X=10/3$, $Y=0$, $F/F'/F''/I=0/1/2/3$: **1**

and at last, the integral within $x=0$ and $x=6$ being 25.2 requires:

$X=0$, $Y=25.2$, $F/F'/F''/I=0/1/2/3$: **3** , followed by the entry for X UPPER = **6**

The result stored in L_1 is: $\{-1/10 \ 1/2 \ 0 \ 18/5\}$ and your function looks like:

$Y_1 = -.1 \cdot x^3 + 1/2 \cdot x^2 + 18/5$. To graph the function press the graph-key.

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