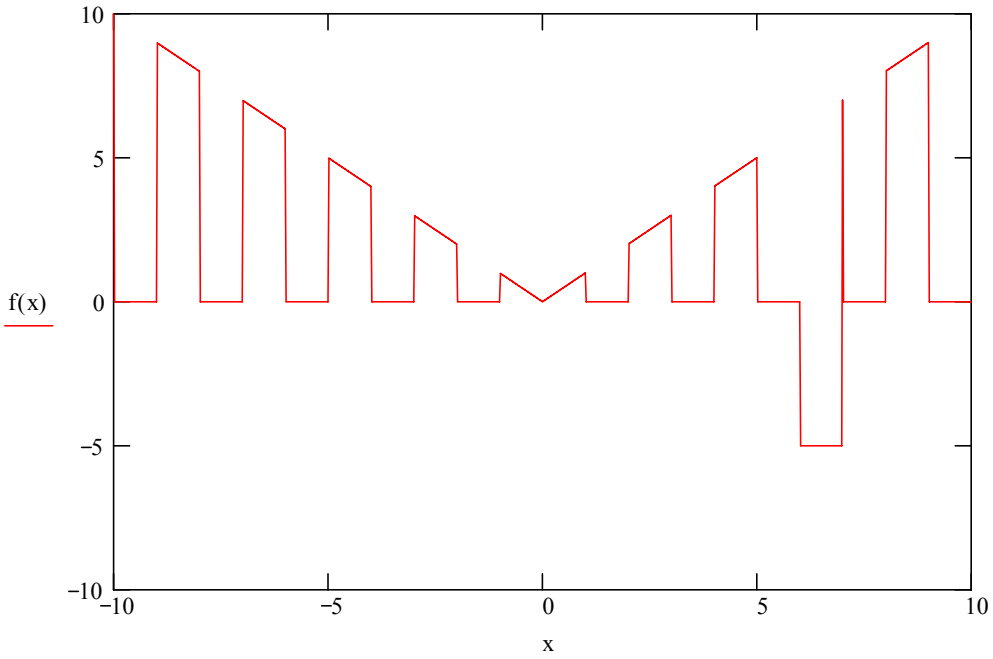
Use 'if' statements to define a complicated function

$$f(x) := \begin{cases} |x| & \text{if } \operatorname{mod}(\operatorname{trunc}(x), 2) = 0 \\ -5 & \text{if } 6 < x < 7 \\ 0 & \text{otherwise} \end{cases}$$

$x := -10, -9.98 .. 10$




To fix the "glitch" at x=7, replace the second < with <=.

Try replacing 'trunc' with 'round' to see the differences.

Create a 2 X n matrix tabulating values of x and x^2, for integer x ranging from 0 to n.
This introduces the 'for' loop.

$$A(n) := \left| \begin{array}{l} \text{for } i \in 0..n \\ \quad \left| \begin{array}{l} B_{0,i} \leftarrow i \\ B_{1,i} \leftarrow i^2 \end{array} \right. \\ B \end{array} \right.$$

Creates a temporary matrix B, and assigns values

Returns B, which is then assigned to A(n)

$$A(7) = \begin{pmatrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 0 & 1 & 4 & 9 & 16 & 25 & 36 & 49 \end{pmatrix}$$

$$\max(A(7)) = 49$$

Find the entry in any two-dimensional matrix having a value closest to m. Returns a three-element array with the result in element zero, and the location (i,,j) in elements 1 and 2.

$$Closest(M, m) := \left| \begin{array}{l} BestSoFar \leftarrow \infty \\ \text{for } i \in 0..rows(M) - 1 \\ \quad \text{for } j \in 0..cols(M) - 1 \\ \quad\quad \text{if } \left|M_{i,j} - m\right| < \left|BestSoFar - m\right| \\ \quad\quad\quad \left| \begin{array}{l} BestSoFar \leftarrow M_{i,j} \\ Location_0 \leftarrow i \\ Location_1 \leftarrow j \end{array} \right. \\ \begin{pmatrix} BestSoFar \\ Location_0 \\ Location_1 \end{pmatrix} \end{array} \right.$$

Initial guess = infinity

Index through the entire matrix

We return an array to allow for all three parameters.

$$Closest(A(7), 10) = \begin{pmatrix} 9 \\ 1 \\ 3 \end{pmatrix}$$

Note that this uses both A() and Closest().

Estimate exp(x) using a Taylor expansion, stopping when a term with magnitude less than tol is encountered. Returns result and number of terms used. Note that this will supplant the built-in (and superior) exp() function, because we use the same name.

Maxterms := 25 Maximum number of terms to allow before quitting

```
exp(x, tol) := | sum ← 0
               | next ← 1·10^99          Needed so first comparison will not exit.
               | n ← 0
               | while |next| > tol
               |     next ← x^n / n!
               |     sum ← sum + next
               |     error("Too many terms--aborting") if n ≥ Maxterms
               |     n ← n + 1
               | (sum  n)
```

$$\exp\left(-5, 1\cdot 10^{-6}\right) = \left(6.7378670306619 \times 10^{-3} \quad 24\right)$$