

pyMaxima-Sitzung (21. September 2010)

(%i1) "Mathe Q1, Di., 2010-09-21"\$

(%i2) f_k(x) := -x^2 + k * x;

(%o2)
$$f_k(x) := -x^2 + kx$$

(%i3) "a)"\$

(%i4) solve(-x^2 + k * x = 0, x);

(%o4) [x = k, x = 0]

(%i5) ev(% , numer);

(%o5) [x = k, x = 0]

(%i6) "NST: x = k, x = 0"\$

(%i7) "b)"\$

(%i8) integrate(-x^2 + k * x, x);

(%o8)
$$\frac{kx^2}{2} - \frac{x^3}{3}$$

"Stammfunktion:"

(%i9) A_k(x) := k*x^2/2-x^3/3;

(%o9)
$$A_k(x) := \frac{kx^2}{2} - \frac{x^3}{3}$$

(%i10) "c)"\$

(%i11) "Flaeche 1 zw. 0 und k, f_k(x) >= 0"\$

(%i12) integrate(-x^2 + k * x, x, 0, k);

(%o12)
$$\frac{k^3}{6}$$

(%i13) "Flaeche 2 zw. k und 3, f_k(x) < 0"\$

(%i14) integrate(-x^2 + k * x, x, k, 3);

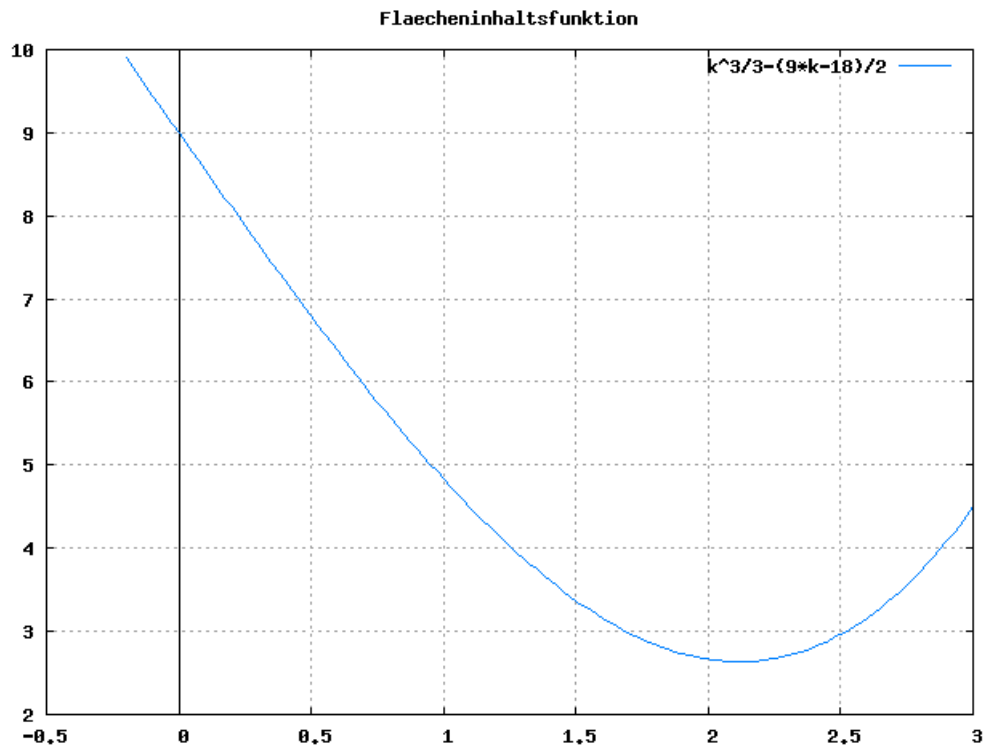
(%o14)
$$\frac{9k - 18}{2} - \frac{k^3}{6}$$

(%i15) A(k) := k^3/6 + abs((9*k-18)/2-k^3/6);

(%o15)
$$A(k) := \frac{k^3}{6} + \frac{|9k - 18|}{2} - \frac{k^3}{6}$$

(%i16) plot2d([A(k)], [k, -1, 3], [y, -10, 10],

[gnuplot_preamble, "set grid; set zeroaxis linetype -1; "])\$



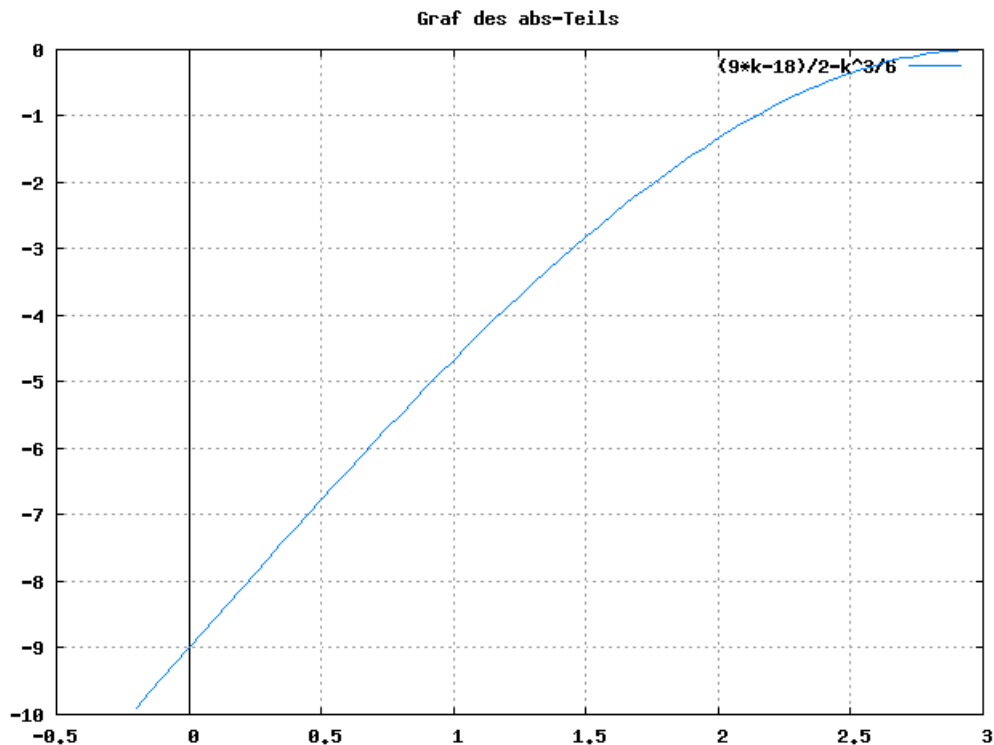
```
(%i17) negativ(k) := (9*k-18)/2-k^3/6;
```

```
(%o17)          3
              9 k - 18   k
negativ(k) :=  ----- - ----
```

```
(%i18) functions;
```

```
(%o18)          [f_k(x), A_k(x), A(k), negativ(k)]
```

```
(%i19) plot2d([negativ(k)], [k, -3, 3], [y, -10, 10],
[gnuplot_preamble, "set grid; set zeroaxis linetype -1; "])$
```



(%i20) "Im Intervall [0;3] ist die Funktion $(9*k-18)/2-k^3/6$ ueberall < 0 , also ..."\$

(%i21) $A(k) := k^3/6 - (9*k-18)/2 + k^3/6$;

(%o21)

$$A(k) := \frac{k^3}{6} - \frac{9k - 18}{2} + \frac{k^3}{6}$$

(%i22) "oder "\$

(%i23) $A(k) := k^3/3 - (9*k-18)/2$;

(%o23)

$$A(k) := \frac{k^3}{3} - \frac{9k - 18}{2}$$

(%i24) $\text{diff}(A(k), k)$;

(%o24)

$$k^2 - \frac{9}{2}$$

(%i25) $\text{solve}(k^2-9/2 = 0, k)$;

(%o25)

$$\left[k = -\frac{3}{\sqrt{2}}, k = \frac{3}{\sqrt{2}} \right]$$

(%i26) $\text{ev}(\%, \text{numer})$;

(%o26) $[k = -2.121320343559642, k = 2.121320343559642]$

(%i27) "Minimum bei $k = 2.1213$ "\$

(%i28) $\text{diff}(A(k), k, 2)$; \Rightarrow 2. Ableitung

(%o28)

$$2k$$

(%i29) " $A''(k_{\min}) = A''(2.1213) = 2*2.1213 > 0 \Rightarrow k$ ist Minimum"\$