>

Demo on derivatives 31 May 2007

Example of taking derivatives.

> $f := x \to cos(x^2)$

$$f := x \to \cos(x^2)$$

> $help(diff)$

> $diff(f, x)$

$$0$$

> $diff(f(x), x)$

$$-2 \sin(x^2)\, x$$

> $fp := x \to -2 \sin(x^2)\, x$

$$fp := x \to -2 \sin(x^2)\, x$$

> $fp(3.)$

$$-2.472710912$$

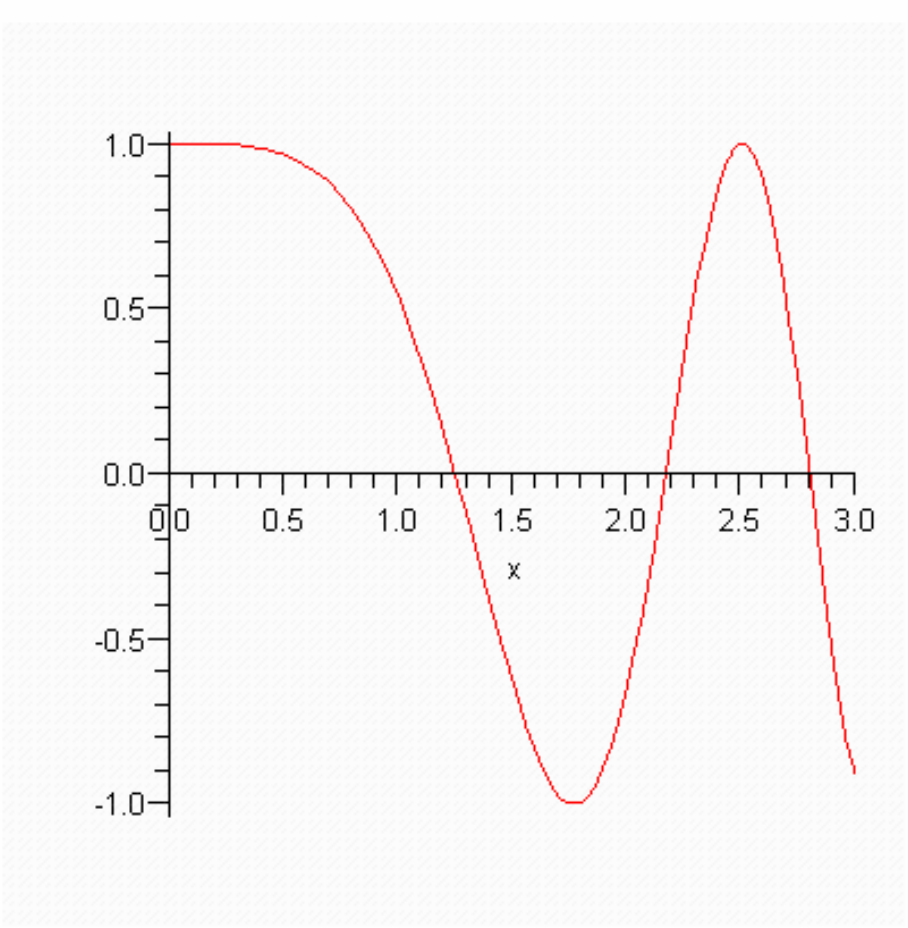
> $D(f)(x)$

$$-2 \sin(x^2)\, x$$

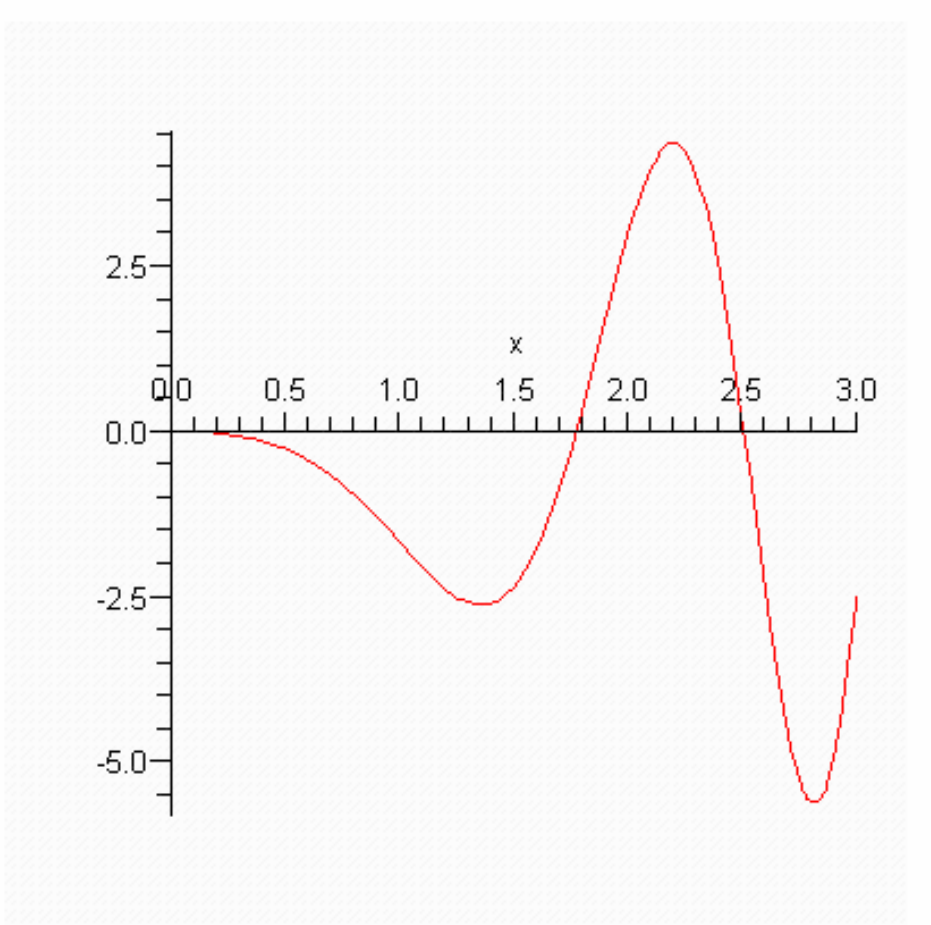
> $D(f)(3.)$

$$-2.472710912$$

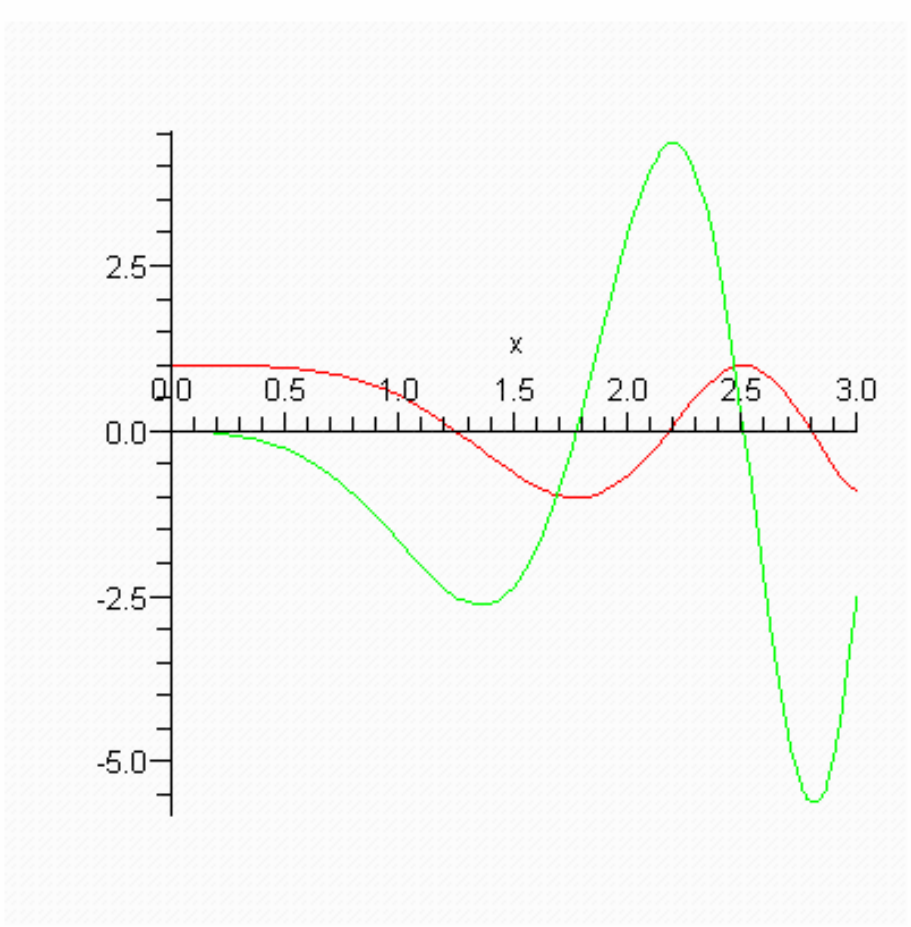
> $plot(f(x), x = 0..3)$



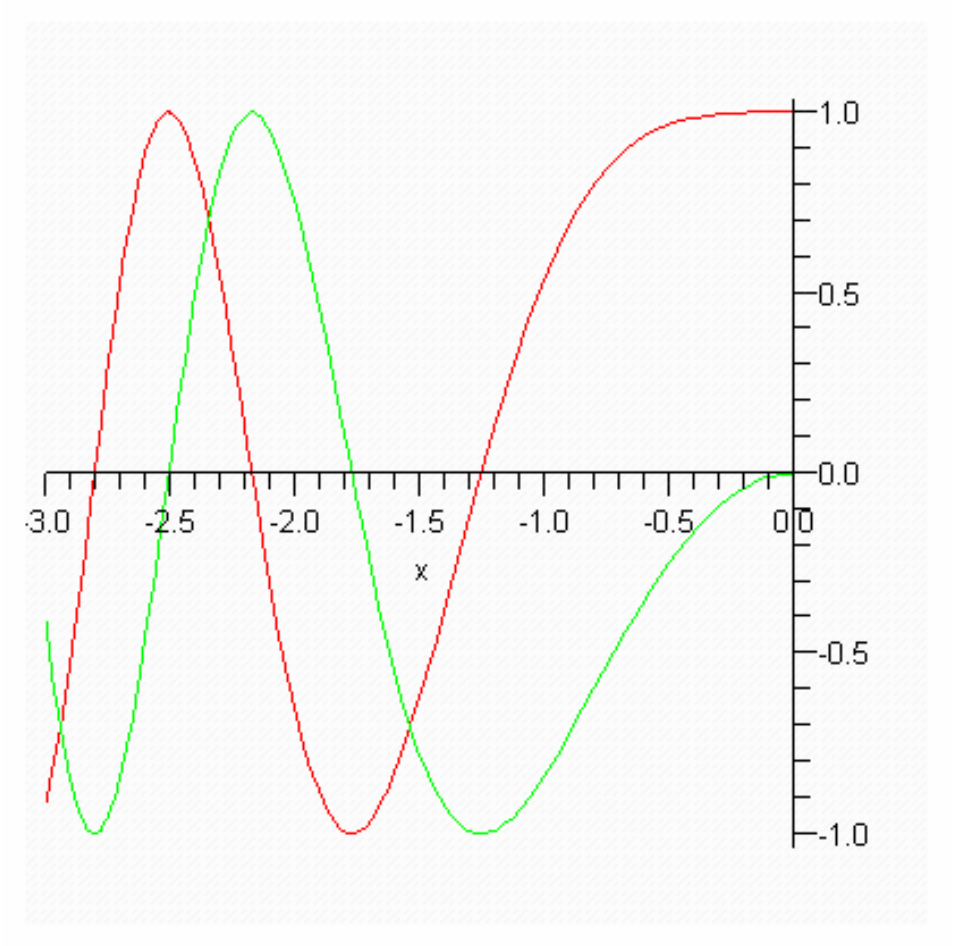
> $plot(D(f)(x), x = 0..3)$



> $plot([f(x), D(f)(x)], x = 0..3)$



> $plot([f(x), -sin(x^2)], x = -3..0)$



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This shows that -sin(x^2) is NOT the derivative of cos(x^2).

Example of motion of a body on the line.

Position of body is given by s(t) = t^3 - 12 t^2 + 36 t

> $s := t \to t^3 - 12 \cdot t^2 + 36 \cdot t$

$$s := t \to t^3 - 12\,t^2 + 36\,t$$

> $v := t \to D(s)(t)$

$$v := t \to (\mathrm{D}(s))(t)$$

> $D(s)(t)$

$$3\,t^2 - 24\,t + 36$$

> $v(3.)$

$$9.$$

> $a := t \to D(v)(t)$

$$a := t \to (\mathrm{D}(v))(t)$$

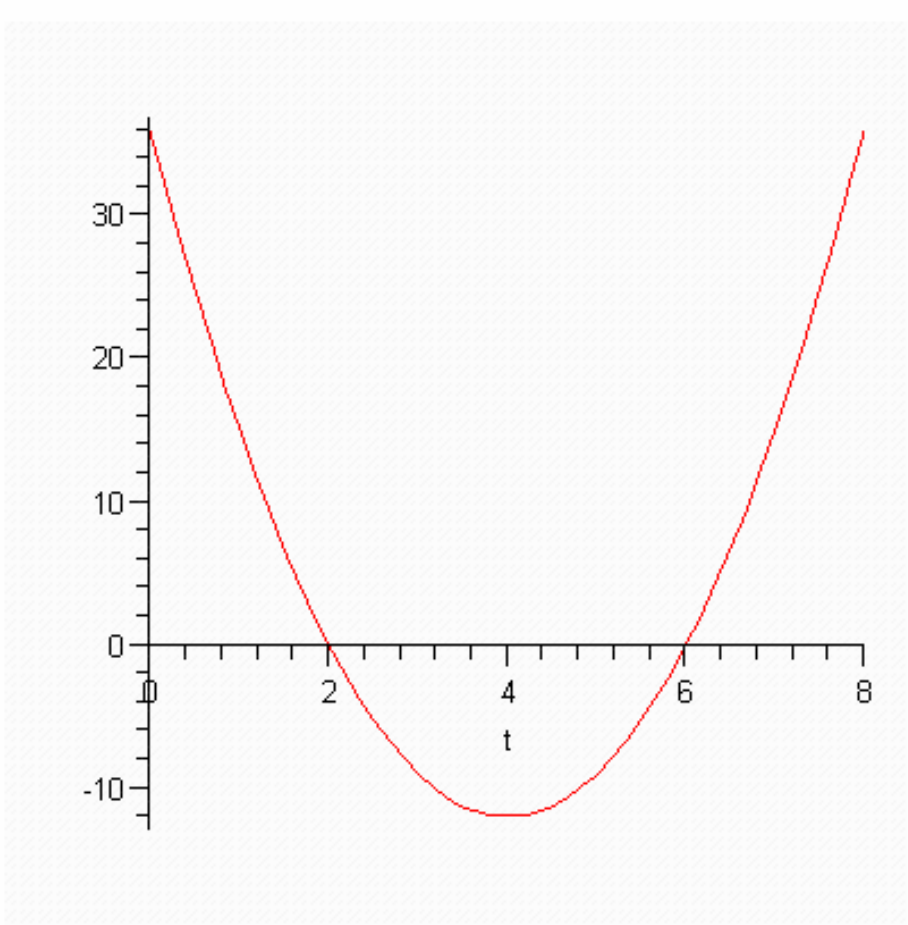
> $eval(a(t))$

$$6\,t - 24$$

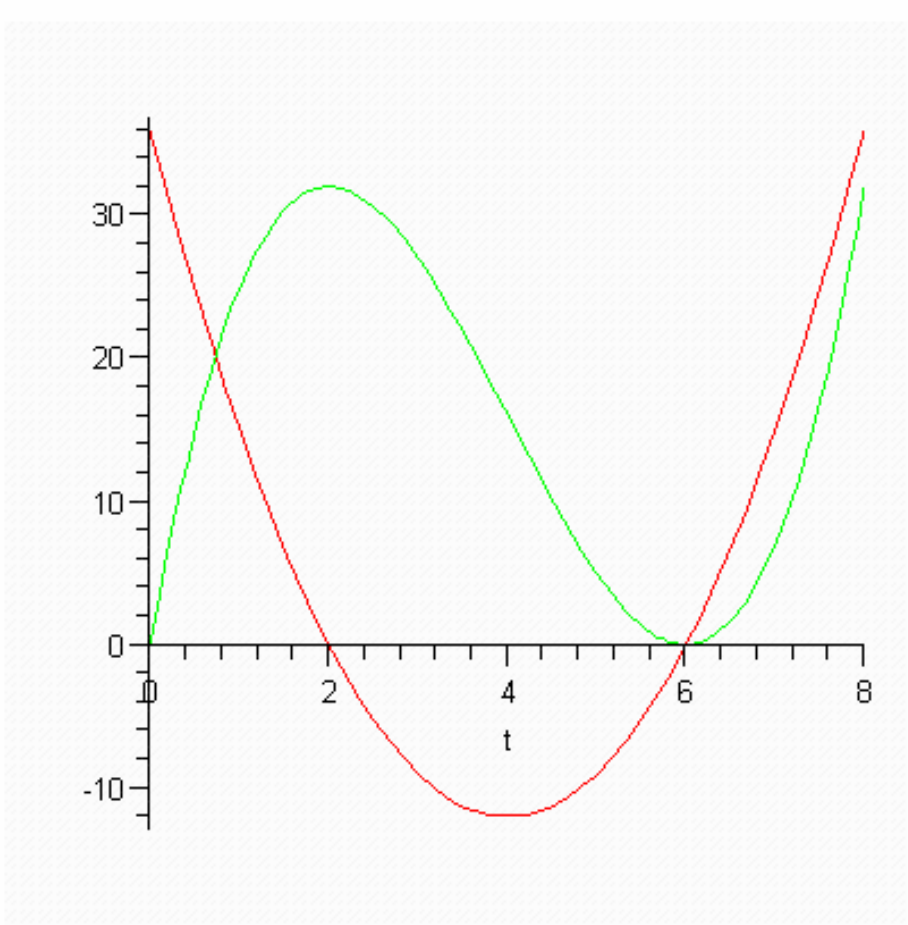
> $D(D(s))(t)$

$$6\,t - 24$$

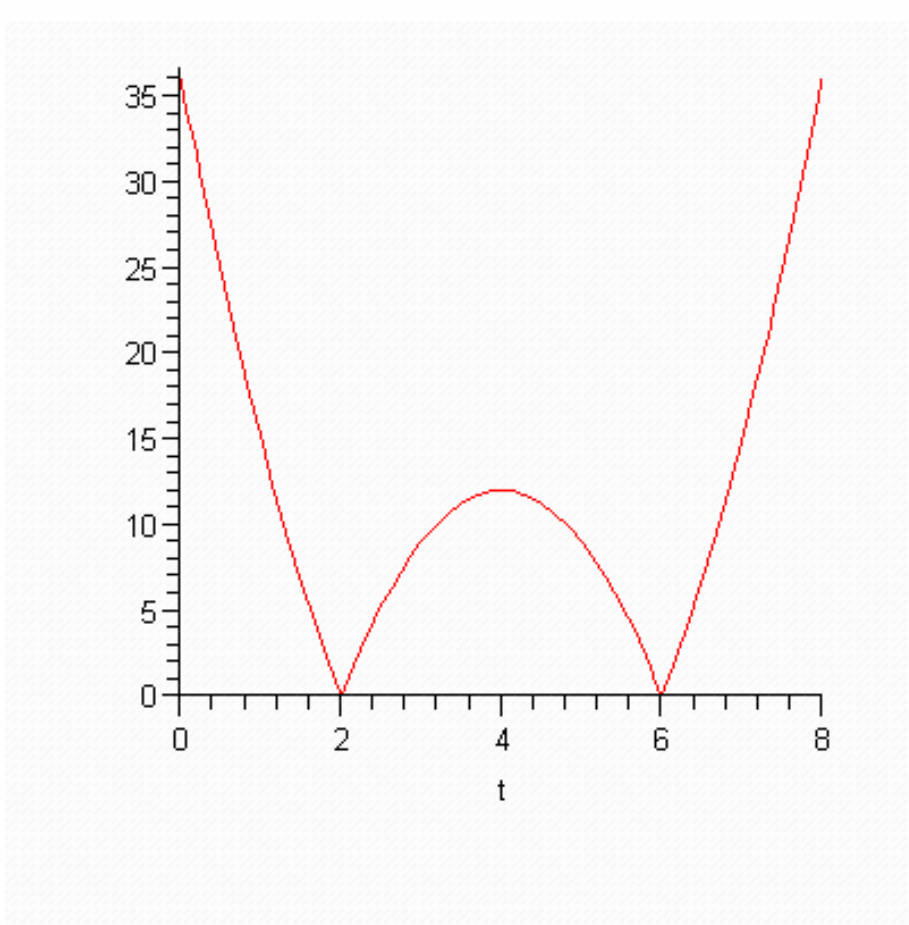
> $plot(v(t), t = 0..8)$



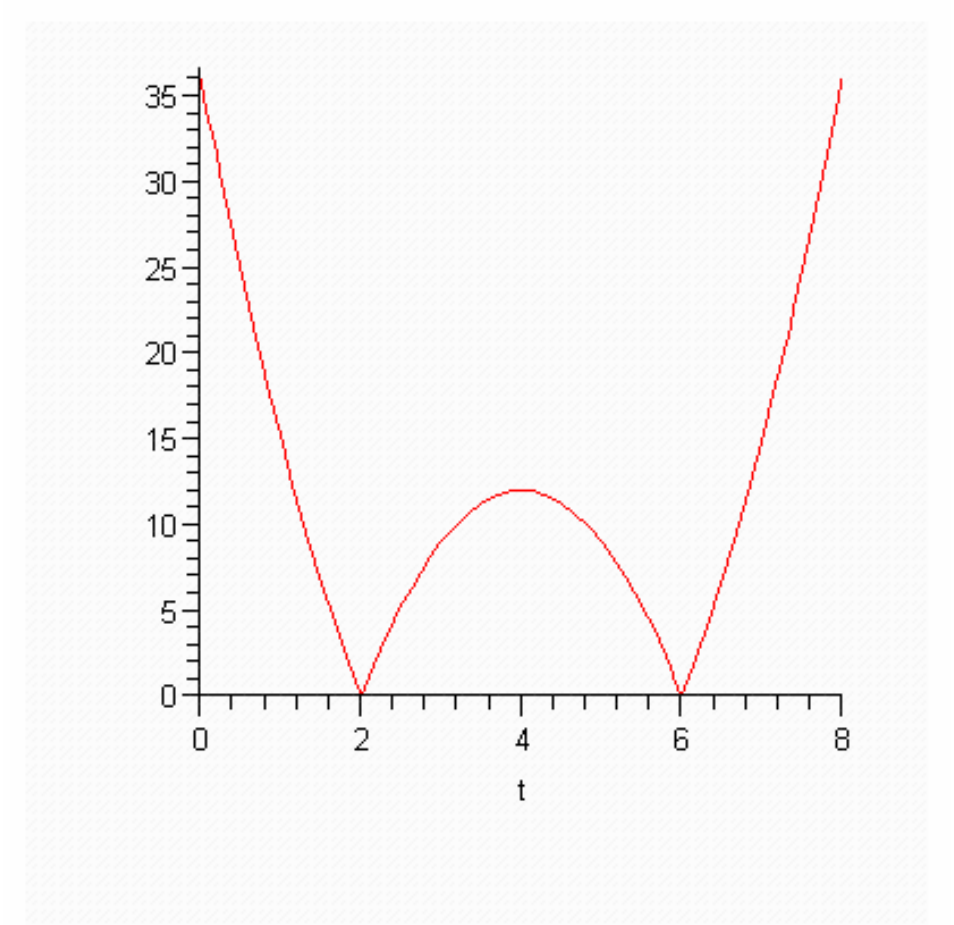
> $plot([v(t), s(t)], t = 0..8)$



> $plot(|v(t)|,\ t = 0..8)$



> $plot(abs(v(t)), t = 0..8)$


35
30
25
20
15
10
5
0
0
2
4
6
8
t

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