Demo on curve sketching.

> $f := x \to 5 \cdot x^5 - 20 \cdot x^4 + 19 \cdot x^3 + 4 \cdot x^2 - 4 \cdot x + 8$

$$f := x \to 5\,x^5 - 20\,x^4 + 19\,x^3 + 4\,x^2 - 4\,x + 8$$

>

Find critical points and intervals of increase and decrease.

> $fp := x \to D(f)(x)$

$$fp := x \to (\mathrm{D}(f))(x)$$

> $eval(fp(x))$

$$25\,x^4 - 80\,x^3 + 57\,x^2 + 8\,x - 4$$

> $fpp := x \to D(fp)(x)$

$$fpp := x \to (\mathrm{D}(fp))(x)$$

> $eval(fpp(x))$

$$100\,x^3 - 240\,x^2 + 114\,x + 8$$

>

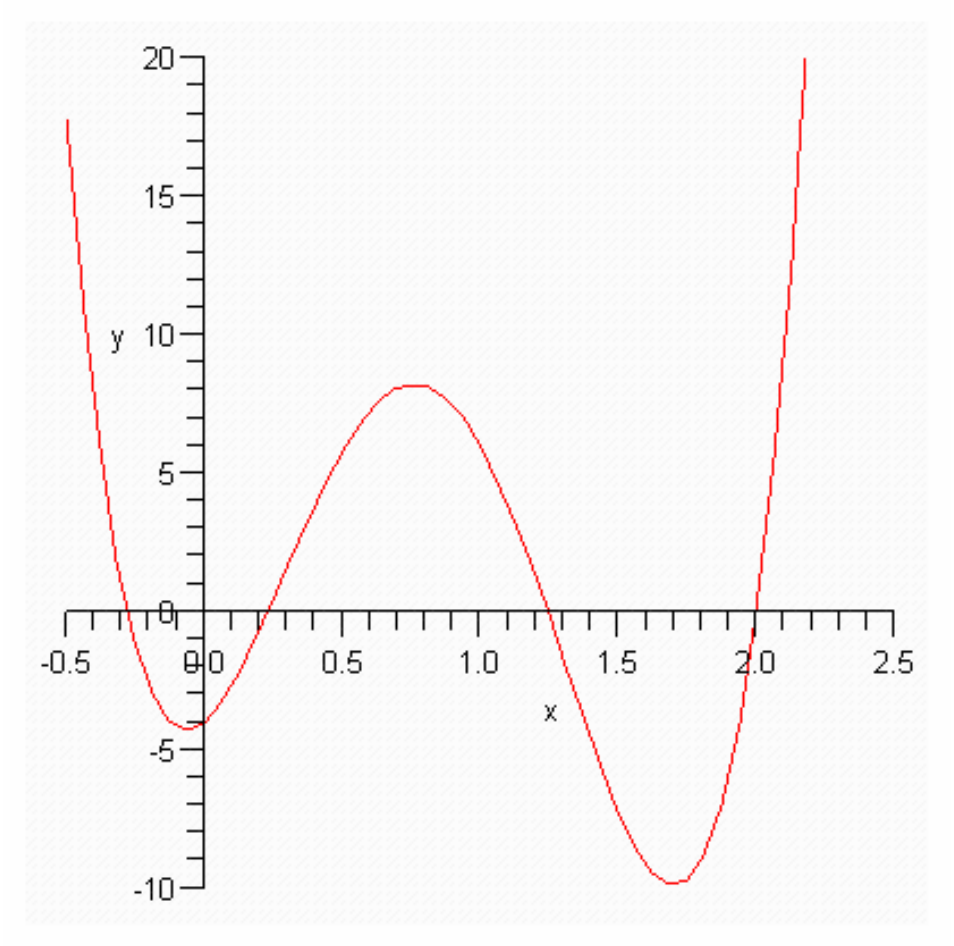
Find critical points.

> $help(fsolve)$

> $fsolve(fp(x))$

$$-.2768854695,\ 0.2321132512,\ 1.244772218,\ 2.$$

> $plot(fp(x), x = -.5 \ldots 2.5, y = -10 \ldots 20)$



>

f(x) increasing on: (-inf,-.27) U (.23,1.2) U (2,inf)
f(x) decreasing on: (-.27,.23) U (1.2, 2)

local max at: x=-.27, x=1.2
local min at: x=.23, x=2

Find concavity and possible inflection pts

> $fsolve(fpp(x))$

$$0.06190066225$$

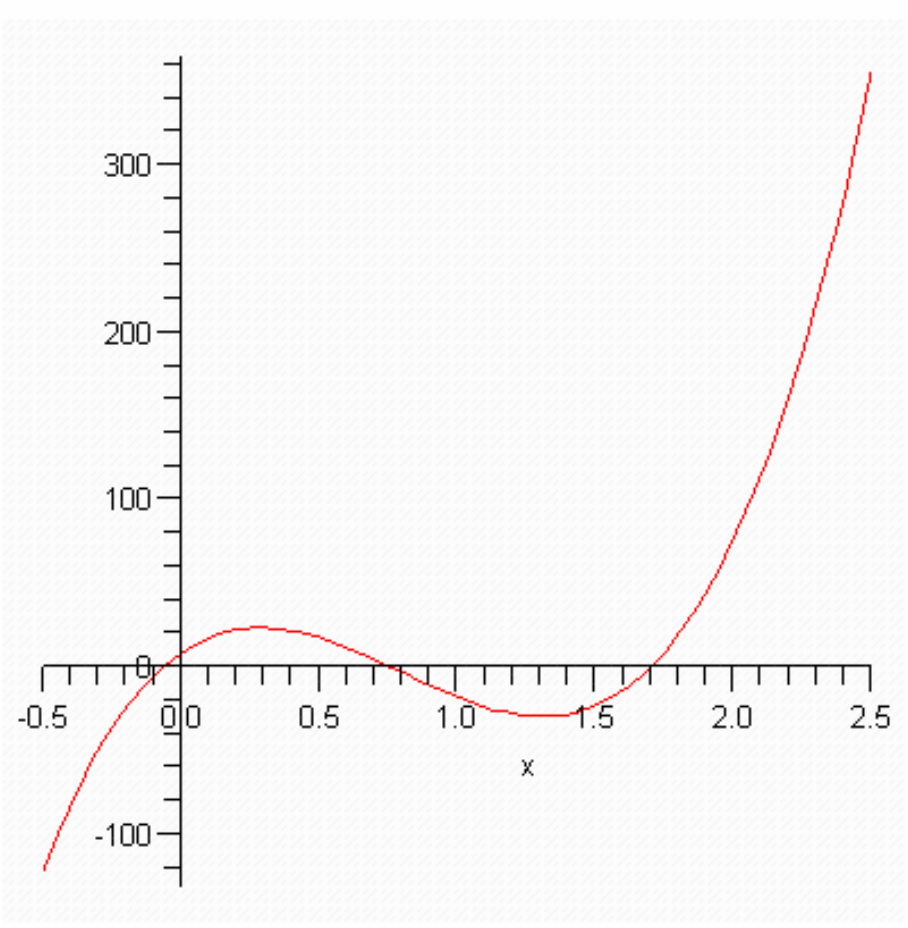
> $fsolve(fpp(x), x=.5..1)$

0
.7588852548

> $fsolve(fpp(x), x = 1.5..2)$

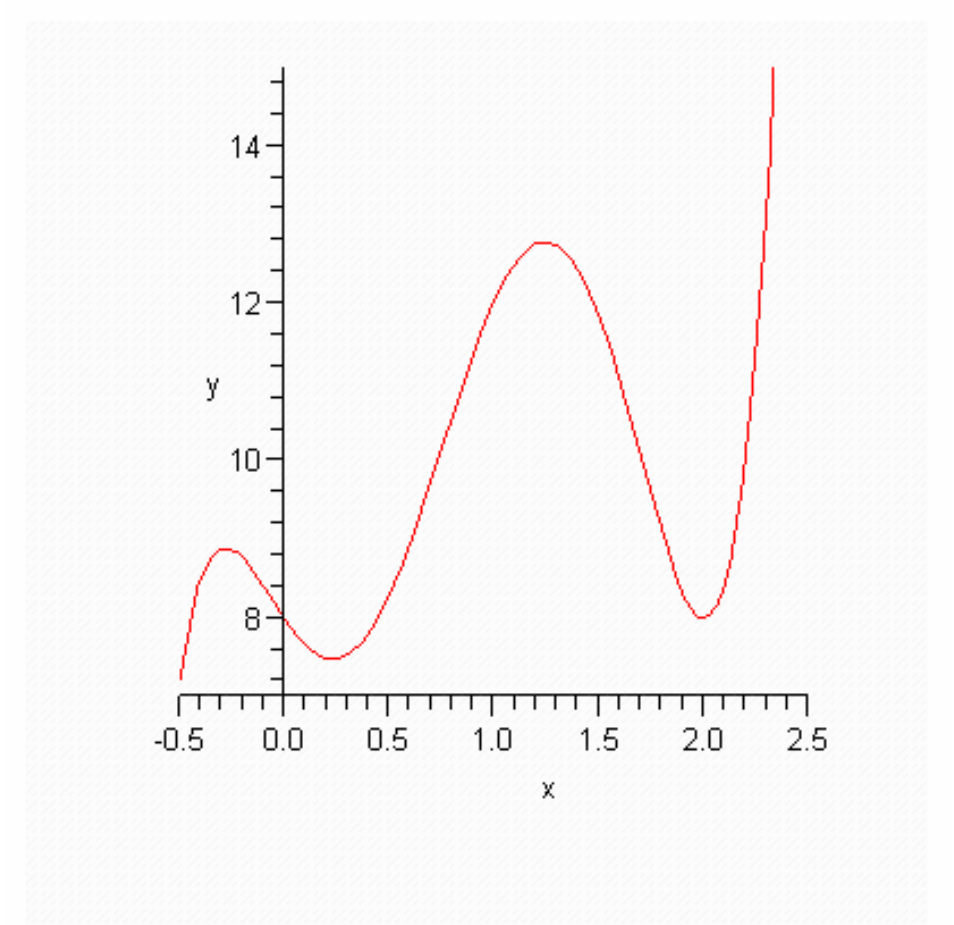
1
.703015407

> $plot(fpp(x), x = -.5..2.5)$

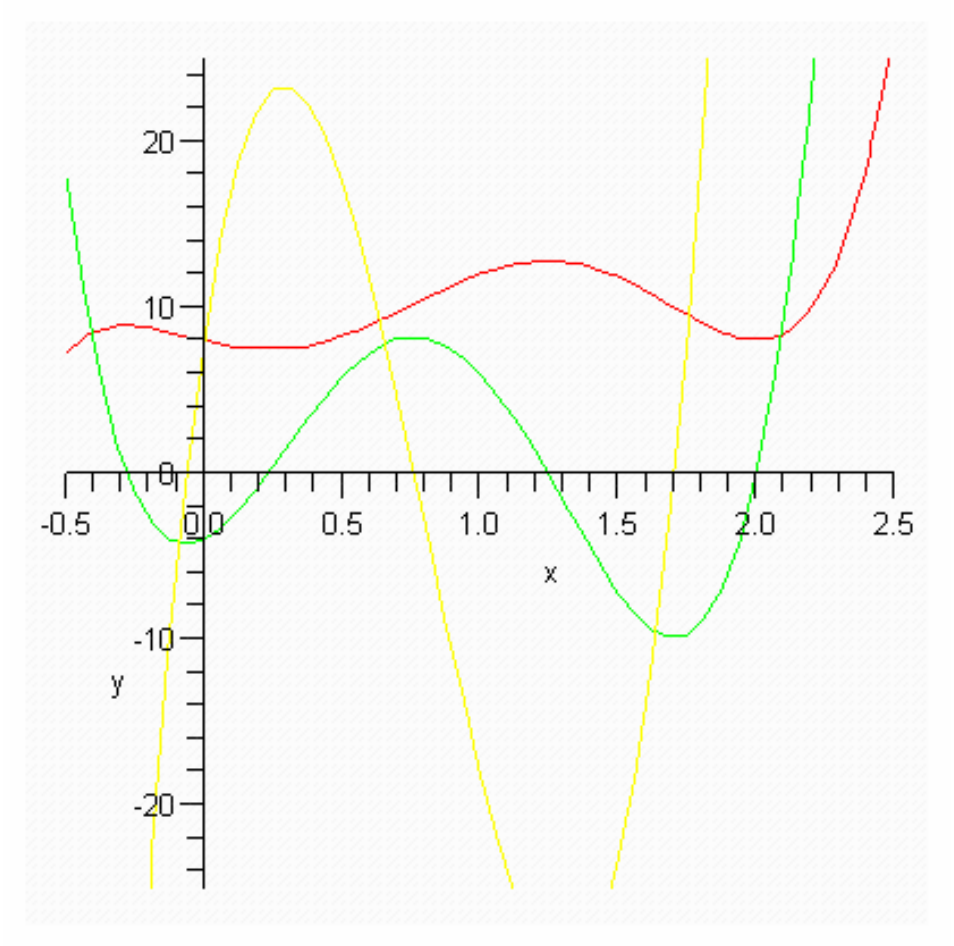


>

> $plot(f(x), x = -.5..2.5, y = 7..15)$



> $plot([f(x), fp(x), fpp(x)], x = -.5..2.5, y = -25..25)$


20
10
0
-10
-20
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
x
y

>