```
> f1 := x -> 2.5*x;
```

$$f1 := x \to 2.5\,x \tag{1}$$

```
> D( (1) );
```

$$2.5 \tag{2}$$

```
> df1 := (2): 'df1';
```

$$df1 \tag{3}$$

```
> f2 := x -> a*x^3 + b*x^2 + c*x + d;
```

$$f2 := x \to a\,x^3 + b\,x^2 + c\,x + d \tag{4}$$

```
> D( (4) );
```

$$x \to 3\,a\,x^2 + 2\,b\,x + c \tag{5}$$

```
> df2 := (5): 'df2';
```

$$df2 \tag{6}$$

```
> f3 := x -> e*x^3 + f*x^2 + g*x + h;
```

$$f3 := x \to e\,x^3 + f\,x^2 + g\,x + h \tag{7}$$

```
> D( (7) );
```

$$x \to 3\,e\,x^2 + 2\,f\,x + g \tag{8}$$

```
> df3 := (8): 'df3';
```

$$df3 \tag{9}$$

```
> f4 := x -> i*x^3 + j*x^2 + k*x + l;
```

$$f4 := x \to i\,x^3 + j\,x^2 + k\,x + l \tag{10}$$

```
> D( (10) );
```

$$x \to 3\,i\,x^2 + 2\,j\,x + k \tag{11}$$

```
> df4 := (11): 'df4';
```

$$df4 \tag{12}$$

```
> f5 := x -> m*x^3 + n*x^2 + o*x + p;
```

$$f5 := x \to m\,x^3 + n\,x^2 + o\,x + p \tag{13}$$

```
> D( (13) );
```

$$x \to 3\,m\,x^2 + 2\,n\,x + o \tag{14}$$

```
> df5 := (14): 'df5';
```

$$df5 \tag{15}$$

```
> F := x -> piecewise(x <=20, f1(x), x > 20 and x <=120, f2(x), x >
  120 and x <= 220, f3(x), x > 220 and x <= 320, f4(x), x > 320 and
  x < 400, f5(x));
```

$$F := x \to piecewise(x \le 20, f1(x), 20 < x \textbf{ and } x \le 120, f2(x), 120 < x \textbf{ and } x \le 220, f3(x), 220 < x \textbf{ and } x \le 320, f4(x), 320 < x \textbf{ and } x < 400, f5(x)) \tag{16}$$

```
> D( (16) );
```

$$x \to piecewise(x \le 20, 2.5, x < 120, 3\,a\,x^2 + 2\,(-120.\,a - 0.01666666667)\,x + 3.166666667 + 3600.\,a, x = 120, undefined, x < 220, 3\,(0.0003206081081 + 4.189189189\,a)\,x^2 + 2\,(-0.1508591091 - 2170.570571\,a)\,x + 3.579639640\,10^5\,a + 21.52258258, x = 220, undefined, x < 320, 3\,(-0.00006106106106 + 0.7357357357\,a)\,x^2 + 2\,(0.03081706707 - 647.4474474\,a)\,x - 2.996571572 + 1.892312312\,10^5\,a, x = 320, undefined, x < 400, \tag{17}$$

$$3\,(0.001446749739 + 1.487465727\,a)\,x^2 + 2\,(-1.549792177 - 1611.981003\,a)\,x + 545.3938667 + 5.756012534\,10^5\,a,\ x = 400,\ \textit{undefined},\ 400 < x,\ 0)$$

```
> dF := (17): 'dF';
```

$$dF \tag{18}$$

```
> eq1 := f1(20) = f2(20);
```

$$eq1 := 50.0 = 50.00000000 \tag{19}$$

```
> eq2 := f2(120) = f3(120);
```

$$eq2 := 4.00000\,10^5\,a + 133.3333333 = 133.3333338 + 4.0000000\,10^5\,a \tag{20}$$

```
> eq3 := f3(220) = f4(220);
```

$$eq3 := 16.2062068 - 2.354354\,10^5\,a = 16.2062061 - 2.3543544\,10^5\,a \tag{21}$$

```
> eq4 := f4(320) = f5(320);
```

$$eq4 := 30.0000001 = 30.00001 \tag{22}$$

```
> eq5 := df1(20) = df2(20);
```

$$eq5 := 2.5 = 2.500000000 \tag{23}$$

```
> eq6 := df2(120) = df3(120);
```

$$eq6 := 18000.\,a - 0.833333333 = -0.83333333 + 18000.0000\,a \tag{24}$$

```
> eq7 := df3(220) = df4(220);
```

$$eq7 := 1.69687187 + 11183.1829\,a = 1.696871873 + 11183.1832\,a \tag{25}$$

```
> eq8 := df4(320) = df5(320);
```

$$eq8 := -2.031606612 + 882.8828\,a = -2.0316066 + 882.883\,a \tag{26}$$

```
> eq9 := f2(80) = 140;
```

$$eq9 := 140.0000000 = 140 \tag{27}$$

```
> eq10 := f3(180) = 25;
```

$$eq10 := 24.9999988 - 0.01\,a = 25 \tag{28}$$

```
> eq11 := f4(260) = 65;
```

$$eq11 := 65.0000004 = 65 \tag{29}$$

```
> eq12 := f5(320) = 30;
```

$$eq12 := 30.00001 = 30 \tag{30}$$

```
> eq13 := f5(400) = 0;
```

$$eq13 := -421.63219 - 3.454759\,10^5\,a = 0 \tag{31}$$

```
> eq14 := df5(400) = 0;
```

$$eq14 := -7.\,10^{-7} = 0 \tag{32}$$

```
> eq15 := f5(325) = 16;
```

$$eq15 := 16.00001 + 0.1\,a = 16 \tag{33}$$

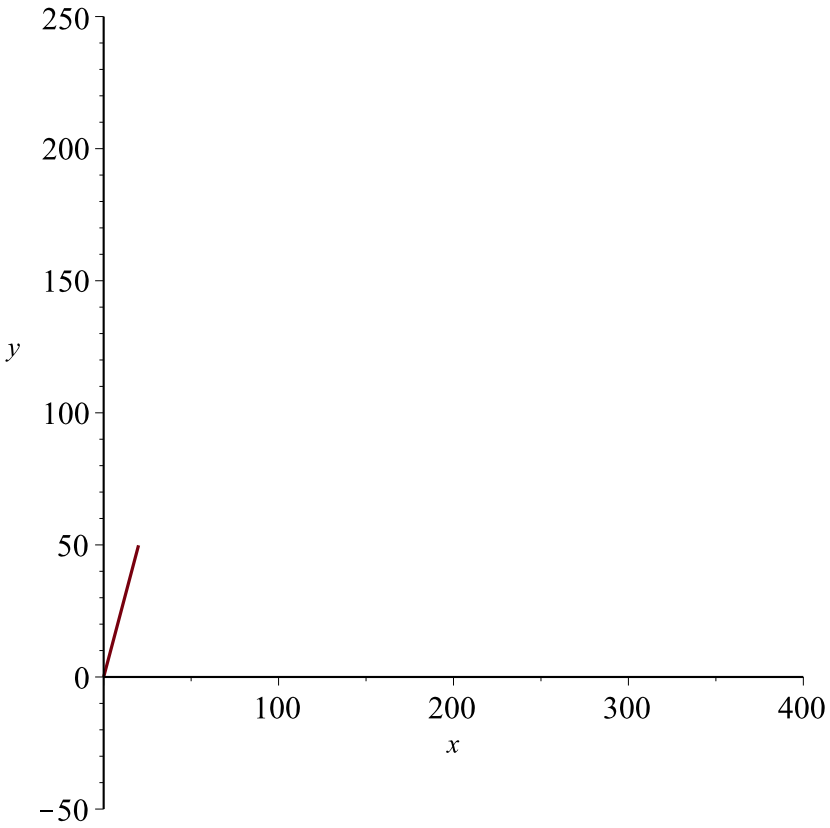
```
> eq16 := f4(300) = 60;
```

$$eq16 := 59.9999995 - 0.01\,a = 60 \tag{34}$$

```
> values := solve({eq1, eq2, eq3, eq4, eq5, eq6, eq7, eq8, eq9,
  eq10, eq11, eq12, eq13, eq14, eq15, eq16}, {a, b, b, c, d, e, f,
  g, h, i, j, k, l, m, n, o, p});
Warning, solving for expressions other than names or functions
is not recommended.
```

$$values := \tag{35}$$

```
> assign(values);
> plot(F(x), x=0..400, y=-50..250);
```


250
200
150
y
100
50
0
100
200
300
400
x
−50