```
> #1.1
> resart:
> x := p^2 - cos(p);
  dx := diff(x, p);
  dy := (2/3*p^3 - p·cos(p) + sin(p) + C1)·dx
```

$$x := p^2 - \cos(p)$$

$$dx := 2p + \sin(p)$$

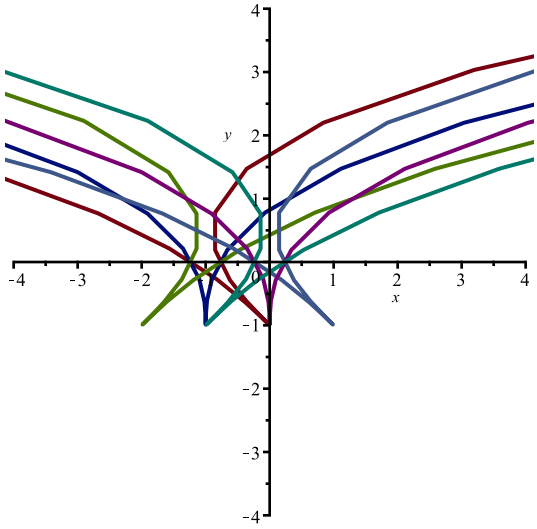
$$dy := \left(\frac{2p^3}{3} - p\cos(p) + \sin(p) + C1\right)(2p + \sin(p)) \quad \textbf{(1)}$$

```
> y := int(dy, p) + C2;
```

$$y := \frac{p\cos(p)^2}{2} - \frac{3\sin(p)\cos(p)}{4} + \frac{p}{4} + 2\sin(p) - 2p\cos(p) - \frac{2p^3\cos(p)}{3} \quad \textbf{(2)}$$

$$- C1\cos(p) + \frac{4p^5}{15} + C1\,p^2 + C2$$

```
> a, b, c := seq(subs(C2 = i, y), i = -1..1):
> a1, a2, a3 := seq(subs(C1 = i, a), i = -1..1):
  b1, b2, b3 := seq(subs(C1 = i, b), i = -1..1):
  c1, c2, c3 := seq(subs(C1 = i, c), i = -1..1):
  len := p = -20..20:
> plot([[a1, x, len], [a2, x, len], [a3, x, len], [b1, x, len], [b2, x, len], [b3, x, len]], x = -4..4, y =
      -4..4)
```




```
>
> #Task 1.2
> restart;
> eq := y·y'' - y'^2 = y·y'·tanh(x);
  eq := subs({y'' = y(x)·z^2 + y(x)·z', y' = y(x)z}, eq);
  eq := simplify(eq);
  #eq := int(1/z, z) = int((tanh(x)), x);
```

$$eq := y(x)\left(\frac{d^2}{dx^2}\,y(x)\right) - \left(\frac{d}{dx}\,y(x)\right)^2 = y(x)\left(\frac{d}{dx}\,y(x)\right)\tanh(x)$$

$$eq := y(x)\left(y(x)\,z(x)^2 + y(x)\left(\frac{d}{dx}\,z(x)\right)\right) - y(x)^2 z(x)^2 = y(x)^2 z(x)\tanh(x)$$

$$eq := y(x)^2\left(\frac{d}{dx}\,z(x)\right) = y(x)^2 z(x)\tanh(x) \qquad \textbf{(3)}$$

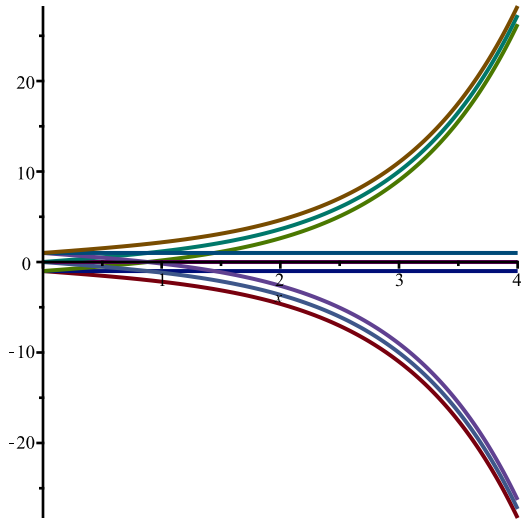
>

```
y_ := ln(|y|) = C1·sinh(x) + C2
```

$$y\_ := \ln(|y|) = C1\sinh(x) + C2 \qquad \textbf{(4)}$$

```
> a, b, c := seq(subs(C2 = i, y_), i = -1 ..1) :
```

```
> a1, a2, a3 := seq(subs(C1 = i, a), i = -1 ..1) :
  b1, b2, b3 := seq(subs(C1 = i, b), i = -1 ..1) :
  c1, c2, c3 := seq(subs(C1 = i, c), i = -1 ..1) :
> plot([rhs(a1), rhs(a2), rhs(a3), rhs(b1), rhs(b2), rhs(b3), rhs(c1), rhs(c2), rhs(c3)], x = 0
      ..4)
```




```
> #Task 1.3
> restart;
  x_ := z^9;
  y_ := 81/190*z^19 + C1;
  a, b, c := seq(subs(C2 = i, y_), i = -1 .. 1) :
  a1, a2, a3 := seq(subs(C1 = i, a), i = -1 .. 1) :
  b1, b2, b3 := seq(subs(C1 = i, b), i = -1 .. 1) :
  c1, c2, c3 := seq(subs(C1 = i, c), i = -1 .. 1) :
   len := z = -20 .. 20;

  pl1 := plot([[a1, x_, len], [a2, x_, len], [a3, x_, len], [b1, x_, len], [b2, x_, len], [b3, x_, len],
       [c1, x_, len], [c2, x_, len], [c3, x_, len]], x = -5 .. 5, y = -5 .. 5) :

   y := C2/2*x^2 - C2/10*x + C3;

  a, b, c := seq(subs(C2 = i, y), i = -1 .. 1) :
```

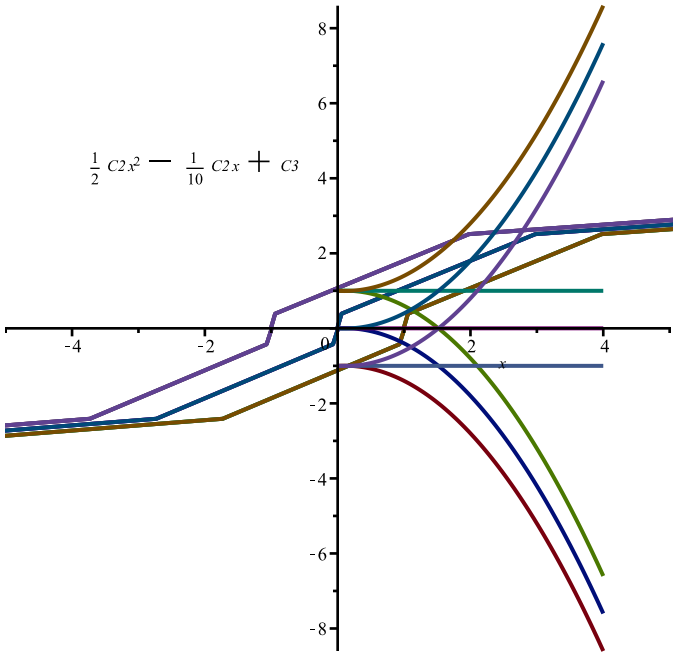
```
a1, a2, a3 := seq(subs(C3 = i, a), i = -1 .. 1) :
b1, b2, b3 := seq(subs(C3 = i, b), i = -1 .. 1) :
c1, c2, c3 := seq(subs(C3 = i, c), i = -1 .. 1) :
pl2 := plot([a1, a2, a3, b1, b2, b3, c1, c2, c3], x = 0 .. 4) :
plots[display]([pl1, pl2]);
```

$$x\_ := z^9$$

$$y\_ := \frac{81\, z^{19}}{190} + C1$$

$$len := z = -20 .. 20$$

$$y := \frac{1}{2}\, C2\, x^2 - \frac{1}{10}\, C2\, x + C3$$




```
>
```

```
> #Task 1.4
> restart;
```

```
> eq := y''=2*(y'/x - y/x^2) + 1/x^2*cos(1/x)
```

$$eq := \frac{d^2}{dx^2}\, y(x) = \frac{2\left(\frac{d}{dx}\, y(x)\right)}{x} - \frac{2\, y(x)}{x^2} + \frac{\cos\left(\frac{1}{x}\right)}{x^2} \qquad (5)$$

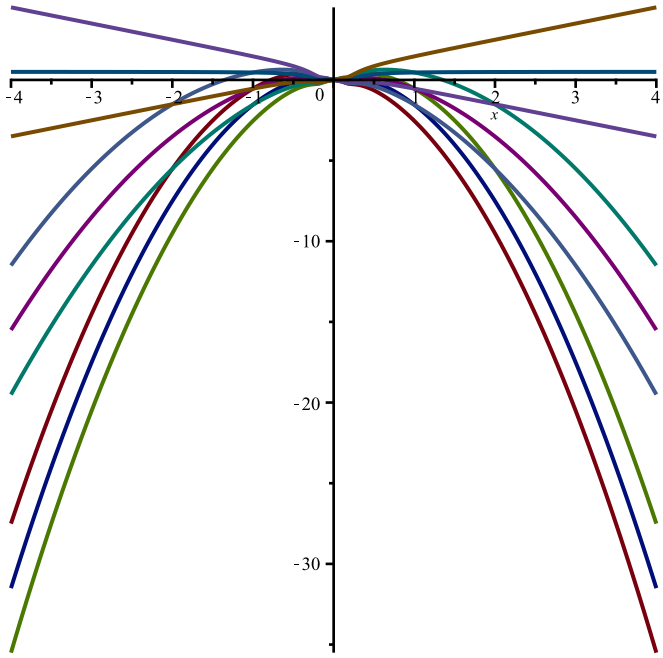
```
> y_ := dsolve(eq);
  y := rhs(y_)
```

$$y\_ := y(x) = -x^2 \cos\left(\frac{1}{x}\right) + \_C2\, x^2 + \_C1\, x$$

(6)

$$y := -x^2 \cos\left(\frac{1}{x}\right) + \_C2\, x^2 + \_C1\, x \tag{6}$$

```
> a, b, c := seq(subs(_C2 = i, y), i = -1 .. 1) :
  a1, a2, a3 := seq(subs(_C1 = i, a), i = -1 .. 1) :
  b1, b2, b3 := seq(subs(_C1 = i, b), i = -1 .. 1) :
  c1, c2, c3 := seq(subs(_C1 = i, c), i = -1 .. 1) :
  pl2 := plot([a1, a2, a3, b1, b2, b3, c1, c2, c3], x = -4 .. 4);
```




```
> #Task 2. Find the general solution of the equation and compare
  with the result obtained in the Maple system.
> restart;
> de := tan(x)·diff(diff(y(x), x), x) − diff(y(x), x) + 1/sin(x) = 0
```

$$de := \tan(x)\left(\frac{d^2}{dx^2}\, y(x)\right) - \frac{d}{dx}\, y(x) + \frac{1}{\sin(x)} = 0 \tag{7}$$

```
> simplify(dsolve(de))
```

$$y(x) = -\_C1\cos(x) + \frac{\ln\left(\frac{1-\cos(x)}{\sin(x)}\right)}{2} + \_C2 \tag{8}$$

```
> #Task 3. Find the general solution of the differential equation.
> restart;
> de := diff(diff(y(x), x), x) + 2·diff(y(x), x) + 5·y(x) = -sin(2·x)
```

$$de := \frac{d^2}{dx^2}\, y(x) + 2\left(\frac{d}{dx}\, y(x)\right) + 5\, y(x) = -\sin(2x) \tag{9}$$

```
> dsolve(de)
```

$$y(x) = e^{-x}\sin(2x)\,\_C2 + e^{-x}\cos(2x)\,\_C1 - \frac{1}{17}\sin(2x) + \frac{4}{17}\cos(2x) \tag{10}$$