p34ed

(parcialillo 34 de ecuaciones)

Problema 1.

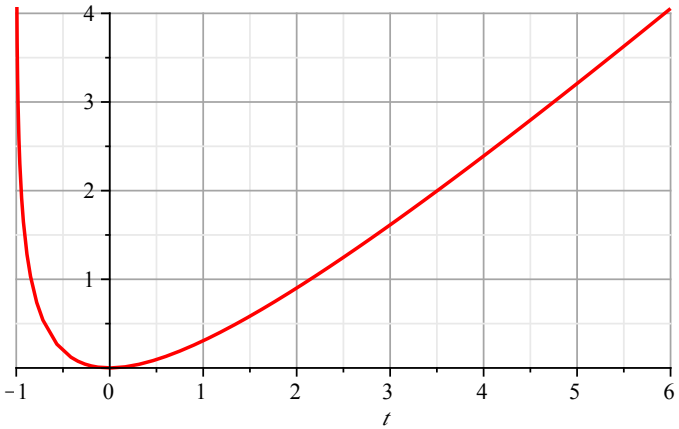
```
> et:=(1+t)*t*diff(x(t),t$2)-diff(x(t),t):
  Order:=4:dsolve(et,x(t),series);
  dsolve(et,x(t));x1:=subs({_C1=0,_C2=1},rhs(%)):
  Order:=6:taylor(x1,t);
  limit(x1,t=infinity);plot(x1,t=-1..6,0..4,thickness=2);
```

$$x(t) = \_C1\, t^2 \left(1 - \frac{2}{3}\, t + \frac{1}{2}\, t^2 - \frac{2}{5}\, t^3 + \mathrm{O}(t^4)\right) + \_C2\, (-2 + \mathrm{O}(t^4))$$

$$x(t) = \_C1 + (t - \ln(1+t))\, \_C2$$

$$\frac{1}{2}\, t^2 - \frac{1}{3}\, t^3 + \frac{1}{4}\, t^4 - \frac{1}{5}\, t^5 + \mathrm{O}(t^6)$$

$$\infty$$




```
> ei:=(1+s)*s*diff(x(s),s$2)+(3*s+2)*diff(x(s),s):
  dsolve(ei,x(s),series);dsolve(ei,x(s));
  series(subs({_C1=0,_C2=-1},rhs(%)),s);
```

$$x(s) = \_C1\, (1 + \mathrm{O}(s^6)) + \_C2 \left(\frac{\ln(s)\, (s + \mathrm{O}(s^6))}{s} + \frac{1 - s - s^2 + \frac{1}{2}\, s^3 - \frac{1}{3}\, s^4 + \frac{1}{4}\, s^5 + \mathrm{O}(s^6)}{s} \right)$$

$$x(s) = \_C1 + \left(-\ln(s) - \frac{1}{s} + \ln(1+s)\right) \_C2$$

$$s^{-1} + \ln(s) - s + \frac{1}{2}\, s^2 - \frac{1}{3}\, s^3 + \frac{1}{4}\, s^4 - \frac{1}{5}\, s^5 + \mathrm{O}(s^6)$$

```
> e1:=s*(s-1)*diff(x(s),s$2)-diff(x(s),s):
  dsolve(e1,x(s));dsolve(e1,x(s),series);
```

$$x(s) = \_C1 + (s - \ln(s))\, \_C2$$

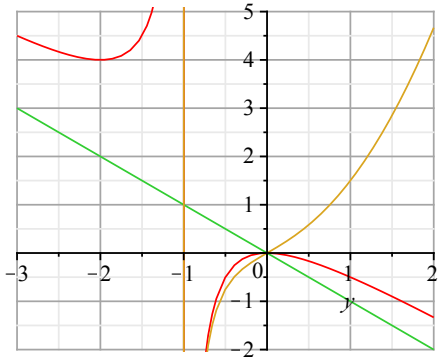
$$x(s) = \_C1\, (1 + \mathrm{O}(s^6)) + \_C2\, (\ln(s)\, (1 + \mathrm{O}(s^6)) + (-s + \mathrm{O}(s^6)))$$

Problema 2.

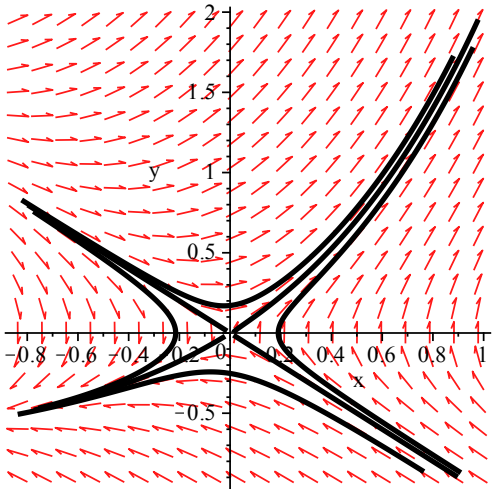
```
> f:=(x+x*y+y^2)/y:factor(diff(f,x)+diff(f,y)*f);
  nf:=solve(%,x):mx:=solve(f,x):[mx,nf];
  plot(%,y=-3..2,-2..5,gridlines=true);
```

$$-\frac{(y+x)\,(x + xy - y^3 - y - y^2)}{y^3}$$

$$\left[-\frac{y^2}{1+y},\ -y,\ \frac{y\,(y + y^2 + 1)}{1+y}\right]$$




```
> with(DEtools):
  phaseportrait([D(x)(t)=y(t),D(y)(t)=x(t)+x(t)*y(t)+y(t)^2],
  [x(t),y(t)],t=-2.3..1.9,[
   [x(0)=-0.08,y(0)=0.08],[x(0)=0.09,y(0)=-0.09],
   [x(0)=-0.18,y(0)=-0.16],[x(0)=0.088,y(0)=0.092],
   [x(0)=0.19,y(0)=0],[x(0)=-0.23,y(0)=-0.08],
   [x(0)=-0.01,y(0)=0.17],[x(0)=-0.15,y(0)=-0.25]],
  stepsize=.01,linecolour=black);
```



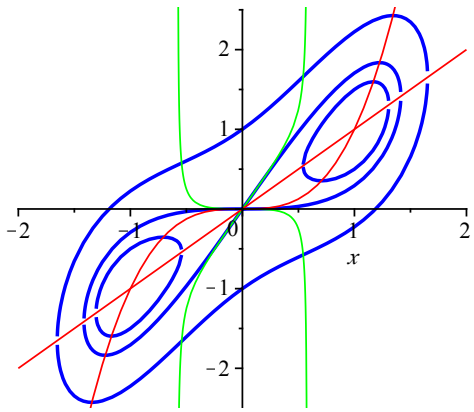
Problema 3.

```
> f:=(y-x^3)/(y-x):factor(diff(f,x)+diff(f,y)*f);
  nf:=factor([solve(%,y)]):f1:=nf[1];f2:=nf[2]:
  dsolve(diff(y(x),x)=subs(y=y(x),f),y(x));
  s1:=C->x+sqrt(C+x^2-x^4/2):s2:=C->x-sqrt(C+x^2-x^4/2):
  plot([s1(0),s2(0),s1(1),s2(1),s1(-1/4),s2(-1/4),f1,f2,x^3,x],
  x=-2..2,-2.5..2.5,thickness=[2,2,2,2,2,2,1,1,1,1],
  color=[blue,blue,blue,blue,blue,blue,green,green,red,red]);
```

$$\frac{3x^2y^2-6x^3y+x^4-y^2+2xy+x^6}{(-y+x)^3}$$

$$f1 := \frac{\left(-1+3x^2+\sqrt{-(3x^2-1)(x-1)^2(x+1)^2}\right)x}{3x^2-1}$$

$$y(x)=x-\frac{1}{2}\sqrt{4x^2-2x^4+8\_C1},\ y(x)=x+\frac{1}{2}\sqrt{4x^2-2x^4+8\_C1}$$




```
> phaseportrait([D(x)(t)=y(t)-x(t),D(y)(t)=y(t)-x(t)^3],
  [x(t),y(t)],t=-3.3..3.3,[[x(0)=1.7,y(0)=0],
   [x(0)=0.1,y(0)=0],[x(0)=-0.1,y(0)=0],
   [x(0)=0.1,y(0)=0.2],[x(0)=-0.1,y(0)=-0.2],
   [x(0)=0.5,y(0)=0.6],[x(0)=-0.5,y(0)=-0.6]],
  stepsize=.01,linecolour=black);
```