In [1]:

```
numerator(x)=x^2+x+1
denominator(x)=x+1
f(x)=numerator(x)/denominator(x)
show(f)
```

Out[1]:

$$x \mapsto \frac{x^2 + x + 1}{x + 1}$$

In [2]:

```
[quotient,remainder]=(numerator(x)).maxima_methods().divide(denominator(x))
show(quotient)
```

Out[2]:

$$x$$

In [3]:

```
show(remainder)
```

Out[3]:

$$1$$

In [4]:

```
show(quotient+remainder/denominator)
```

Out[4]:

$$x \mapsto x + \frac{1}{x + 1}$$

In [5]:

```
# double check
show(f.partial_fraction())
```

Out[5]:

$$x \mapsto x + \frac{1}{x + 1}$$

In [6]:

```
fdash(x)=derivative(f(x),x)
show(fdash)
```

Out[6]:

$$x \mapsto \frac{2\,x + 1}{x + 1} - \frac{x^2 + x + 1}{(x + 1)^2}$$

In [7]:

```
show(solve(fdash(x)==0,x))
```

Out[7]:

$$[x = (-2), x = 0]$$

In [8]:

```
show(f(-2))
```

Out[8]:

$$-3$$

In [9]:

```
show(f(0))
```

Out[9]:

$$1$$

In [10]:

```
fddash(x)=derivative(f(x),x,2)
show(fddash)
```

Out[10]:

$$x \mapsto -\frac{2\,(2\,x+1)}{(x+1)^2}+\frac{2}{x+1}+\frac{2\left(x^2+x+1\right)}{(x+1)^3}$$

In [11]:

```
show(solve(fddash(x)==0,x))
```

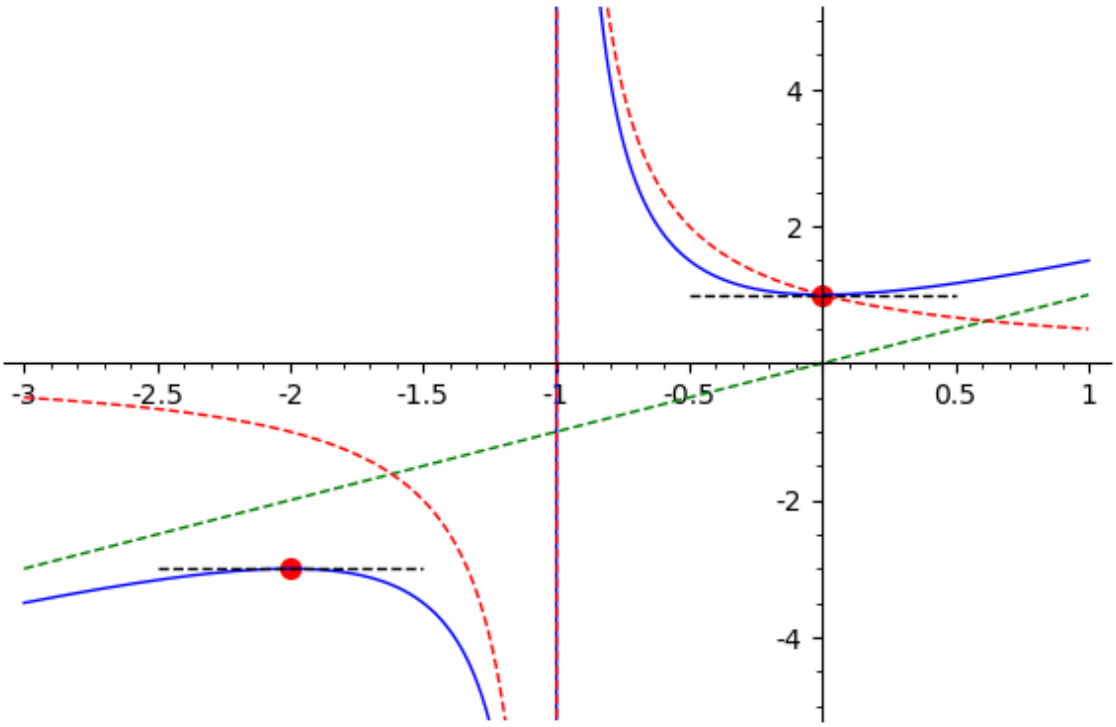
Out[11]:

$$[]$$

In [12]:

```
p1=plot(f(x),x,-3,1)
p2=plot(x,x,-3,1,rgbcolor="green", linestyle = "dashed" )
p3=plot(1/(x+1),x,-3,1, rgbcolor="red", linestyle = "dashed")
p4=plot(-3,x,-5/2,-3/2,rgbcolor="black", linestyle = "dashed" )
p5=plot(1,x,-1/2,1/2,rgbcolor="black", linestyle = "dashed" )
pt1 = point((-2, -3), rgbcolor="red", pointsize=50, faceted=True)
pt2 = point((0, 1), rgbcolor="red", pointsize=50, faceted=True)
(p1+p2+p3+p4+p5+pt1+pt2).show(xmin=-3, xmax=1, ymin=-5, ymax=5)
```

Out[12]:



In [0]: