par1M

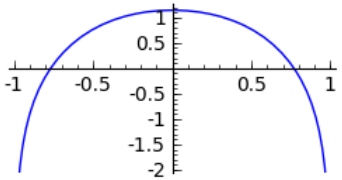
(primer parcial de matemáticas)

Problema 1.

```
t=pi-4*arctan(x^2);f=log(t)
solve(t>0,x);diff(f,x);_.subs(x=3^(1/4));_.simplify()
```

```
[[pi - 4*arctan(x^2) > 0]]
-8*x/((x^4 + 1)*(pi - 4*arctan(x^2)))
-2*3^(1/4)/(pi - 4*arctan(sqrt(3)))
6*3^(1/4)/pi
```

```
plot(f,-1,1,ymin=-2,ymax=1.2,figsize=[3,1.5])
```



Problema 2.

```
var('n');an=((8*n^7*(1-n^2))^(1/3)-n^2*sin(1/n))/(n+1)^3
limit(an,n=oo)
```

```
2*(-1)^(1/3)
```

```
l=limit((-1)^n*sqrt(n*(n-1))/(n+1),n=oo)
lp=limit(sqrt(2*n*(2*n-1))/(2*n+1),n=oo)
li=limit(-sqrt(2*n*(2*n+1))/(2*n+2),n=oo)
l,lp,li
```

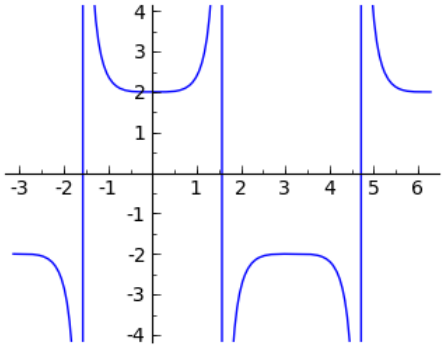
```
(2*I*pi*und, 1, -1)
```

Problema 4.

```
g=1/cos(x)+cos(x);gp=diff(g,x).simplify_trig();
gs=diff(gp,x).simplify_trig().factor();gp;gs
```

```
sin(x)^3/cos(x)^2
-(sin(x)^2 - 3)*sin(x)^2/cos(x)^3
```

```
plot(g,x,-pi,2*pi,ymin=-4,ymax=4,figsize=[4,3])
```



Problema 5.

```
h(x)=(3*x+1)/(x^3+1);factor(diff(h(x),x));factor(diff(h(x),x,2))
```

```
-3*(2*x^3 + x^2 - 1)/((x + 1)^2*(x^2 - x + 1)^2)
6*(3*x^4 + 2*x^3 - 6*x - 1)*x/((x + 1)^3*(x^2 - x + 1)^3)
```

```
P(x)=2*x^3+x^2-1;P.find_root(0,1);h(_)
```

```
0.65729810613878059
2.3145962122767525
```

```
Q(x)=3*x^4+2*x^3-6*x-1;Q.find_root(-1,0),Q.find_root(1,2)
```

```
(-0.16784603004380913, 1.1301467382482941)
```

```
h(-2),h(-5/4),h(-1/2),h(1),h(4)
```

```
(5/7, 176/61, -4/7, 2, 1/5)
```

```
dh=plot(h,-3,5,thickness=2);dP=plot(P,-3,5,color='red')
show(dh+dP,ymin=-2,ymax=3)
```