Par1M

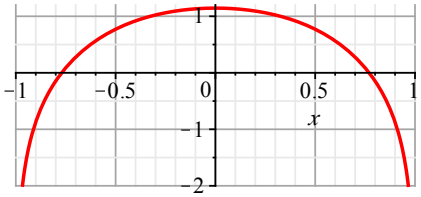
(primer parcial de matemáticas)

Problema 1.

```
> p:=Pi-4*arctan(x^2):f:=log(p):[solve(p>0),solve({p>0})];
  df:=diff(f,x):[df,eval(subs(x=3^(-1/4),df))];
  plot(f,x=-1..1,-2..1.2,gridlines=true,thickness=2);
```

$$[\mathit{RealRange}(\mathit{Open}(-1), \mathit{Open}(1)), \{-1 < x, x < 1\}]$$

$$\left[-\frac{8\,x}{(1+x^4)\,(\pi - 4\arctan(x^2))}, -\frac{6\,3^{3/4}}{\pi}\right]$$



Problema 2.

```
> assume(n::posint):R:=8*n^7*(1-n^2):
  radsimp(limit((R^(1/3)-n^2*sin(1/n))/(n+1)^3,n=infinity));
  a:=n->(surd(R,3)-n^2*sin(1/n))/(n+1)^3:limit(a(n),n=infinity);
  b:=n->(-1)^n*sqrt(n*(n-1))/(n+1):
  [limit(b(n),n=infinity),limit(simplify(b(2*n)),n=infinity),
  limit(simplify(b(2*n+1)),n=infinity)];
```

$$1 + \mathrm{I}\sqrt{3}$$

$$-2$$

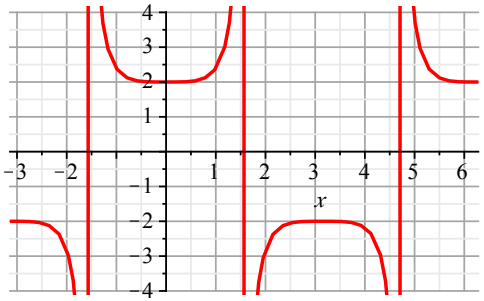
$$[-1\,..1, 1, -1]$$

Problema 4.

```
> g:=1/cos(x)+cos(x):dg:=diff(g,x):sg:=diff(g,x$2):
  factor(simplify([dg,sg]));
  use RealDomain in solve(sg=0,x) end use;
  plot(g,x=-Pi..2*Pi,-4..4,gridlines=true,thickness=2);
```

$$\left[\frac{\sin(x)^3}{\cos(x)^2}, \frac{\sin(x)^2\,(\cos(x)^2+2)}{\cos(x)^3}\right]$$

$$0, \pi$$



Problema 5.

```
> h:=x->(3*x+1)/(x^3+1):P:=2*x^3+x^2-1:Q:=3*x^4-6*x+2*x^3-1:
  factor([diff(h(x),x),diff(h(x),x$2)]);
  [fsolve(P),fsolve(Q)];h(%[1]);
  [[h(-2),h(-5/4),h(-1/2),h(1),h(4)],solve(h(x)=176/61)];
  [subs(x=-1/3,P),subs(x=-1/2,P)];
```

$$\left[-\frac{3\,(2\,x^3+x^2-1)}{(x+1)^2\,(x^2-x+1)^2}, \frac{6\,x\,(3\,x^4-6\,x+2\,x^3-1)}{(x+1)^3\,(x^2-x+1)^3}\right]$$

$$[0.6572981061, -0.1678460300, 1.130146738]$$

$$2.314596212$$

$$\left[\left[\frac{5}{7}, \frac{176}{61}, -\frac{4}{7}, 2, \frac{1}{5}\right], -\frac{5}{4}, \frac{5}{8}+\frac{1}{88}\,\mathrm{I}\sqrt{1023}, \frac{5}{8}-\frac{1}{88}\,\mathrm{I}\sqrt{1023}\right]$$

$$\left[-\frac{26}{27}, -1\right]$$

```
> plot([h(x),P],x=-3..4,-2..3,thickness=[3,2],
  gridlines=true,colour=[red,blue]);
```