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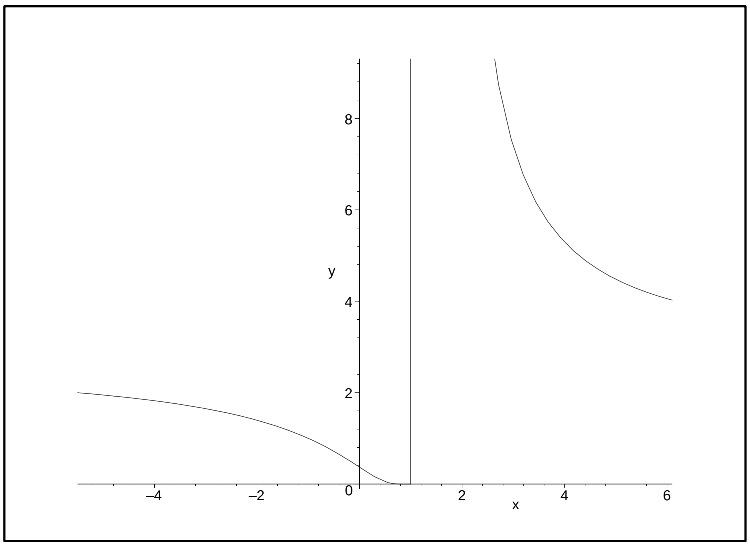
Analisi Matematica I, compito del 12/4/00, ore 2

ES.1 Disegnare il grafico della seguente funzione

```
> restart:
> f:=x->exp((x+1)/(x-1));
```

$$f := x \to \exp\left(\left(\frac{x+1}{x-1}\right)\right)$$

```
> plot(f(x),x=-5.5..6.1,y=-0.1..9.3);
```



ES.2 Determinare il polinomio di Taylor di grado 6 centrato in 0 della seguente funzione

```
> restart:
> f:=x->(exp(x^2)-cos(x))/sqrt(1+x^2);
```

$$f := x \to \frac{e^{(x^2)} - \cos(x)}{\sqrt{1+x^2}}$$

```
> taylor(f(x),x=0,7);
```

$$\frac{3}{2}\,x^2 - \frac{7}{24}\,x^4 + \frac{361}{720}\,x^6 + \mathrm{O}(x^7)$$

Es. 3 Determinare l'area della parte limitata di piano compresa fra i grafici delle funzioni

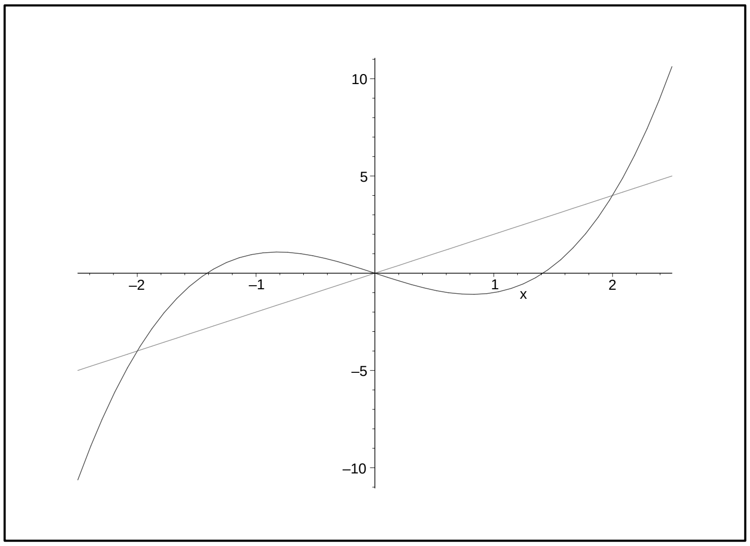
```
> restart:
> f:=x->x^3-2*x;
```

$$f := x \to x^3 - 2\,x$$

```
> g:=x->2*x;
```

$$g := x \to 2\,x$$

```
> plot([f(x),g(x)],x=-2.5..2.5);
```




```
> Int(f(x)-g(x),x=-2..0)+Int(g(x)-f(x),x=0..2)=int(f(x)-g(x),x=-2..0)+int(g(x)-f(x),x=0.
```

$$\int_{-2}^{0} x^3 - 4\,x\,dx + \int_{0}^{2} 4\,x - x^3\,dx = 8$$

```
> int(abs(f(x)-g(x)),x=-2..2);
```

$$8$$

```
> solve(f(x)=g(x),x);
```

$$0,\ 2,\ -2$$

Es.4 Determinare la soluzione del seguente problema di Cauchy

```
> restart:
> eq:= {diff(y(x),x,x)-2*diff(y(x),x)+y(x)=exp(2*x)};
> soln:=dsolve(eq,{y(x)});
```

$$eq := \{(\frac{\partial^2}{\partial x^2}\,\mathrm{y}(x)) - 2\,(\frac{\partial}{\partial x}\,\mathrm{y}(x)) + \mathrm{y}(x) = e^{(2\,x)}\}$$

$$soln := \mathrm{y}(x) = e^{(2\,x)} + \_C1\,e^x + \_C2\,e^x\,x$$

```
> ic:={y(0)=0,D(y)(0)=1};
```

$$ic := \{\mathrm{y}(0) = 0,\ \mathrm{D}(y)(0) = 1\}$$

```
> dsolve(eq union ic,{y(x)});
```

$$\mathrm{y}(x) = e^{(2\,x)} - e^x$$