```
> restart:with( plots):with (student):
Warning, the name changecoords has been redefined
```

THESE ARE THE SOLUTIONS TO THE SAMPLE EXAM II QUESTIONS

page 1 Section I ex 1

```
> g(x):= sqrt(x^3*tan(x^4)):
> Diff(g(x),x); eval(diff(g(x),x));
```

$$\frac{\partial}{\partial x}\sqrt{x^3\tan(x^4)}$$

$$\frac{1}{2}\frac{3x^2\tan(x^4)+4x^6\left(1+\tan(x^4)^2\right)}{\sqrt{x^3\tan(x^4)}}$$

ex2

```
> g(x):= cos(tan(x)):
> Diff(g(x),x); eval(diff(g(x),x));
>
```

$$\frac{\partial}{\partial x}\cos(\tan(x))$$

$$-\sin(\tan(x))\left(1+\tan(x)^2\right)$$

```
>
```

ex3

```
> f := x*sin(y)= y-1;
> implicitdiff(f,y,x);
```

$$f := x\sin(y) = y-1$$

$$-\frac{\sin(y)}{x\cos(y)-1}$$

ex4

```
> f := y*sqrt(x-1+x*sqrt(y-1))= x*y;implicitdiff(f,y,x);
```

$$f := y\sqrt{x-1+x\sqrt{y-1}} = xy$$

$$-2\frac{y\left(\sqrt{y-1}+y-1-2\sqrt{x-1+x\sqrt{y-1}}\sqrt{y-1}\right)}{4x\sqrt{y-1}-4\sqrt{y-1}+5xy-4x-4x\sqrt{x-1+x\sqrt{y-1}}\sqrt{y-1}}$$

ex5

```
> g(x):= (x-1)*(x-4)/(x-2):
> Diff(g(x),x); eval(diff(g(x),x));
```

$$\frac{\partial}{\partial x}\frac{(x-1)(x-4)}{x-2}$$

$$\frac{x-4}{x-2}+\frac{x-1}{x-2}-\frac{(x-1)(x-4)}{(x-2)^2}$$

ex6

```
> g(x):= sin(2*x)/x:
> Diff(g(x),x); eval(diff(g(x),x));
```

$$\frac{\partial}{\partial x}\frac{\sin(2x)}{x}$$

$$2\frac{\cos(2x)}{x}-\frac{\sin(2x)}{x^2}$$

Section II ex1

```
> g(x):= 1/sqrt(4*x-3*x^2):
> Diff(g(x),x); eval(diff(g(x),x));
```

$$\frac{\partial}{\partial x}\frac{1}{\sqrt{4x-3x^2}}$$

$$-\frac{1}{2}\frac{4-6x}{(4x-3x^2)^{(3/2)}}$$

ex2

```
> g(x):= 3*x + cos(x):
> Diff(g(x),x); eval(diff(g(x),x));
>
```

$$\frac{\partial}{\partial x}(3x+\cos(x))$$

$$3-\sin(x)$$

```
> 
```

ex3

```
> g(x):= x^3/(4-sin(2*x)):
> Diff(g(x),x); eval(diff(g(x),x));
```

$$\frac{\partial}{\partial x}\frac{x^3}{4-\sin(2x)}$$

$$\frac{\partial}{\partial x}\frac{x^3}{4-\sin(2x)}$$

$$3\frac{x^2}{4-\sin(2x)}+\frac{2x^3\cos(2x)}{(4-\sin(2x))^2}$$

ex4

```
> g(x):= (5*x^2+cos(2*x))^3:
> Diff(g(x),x); eval(diff(g(x),x));
>
```

$$\frac{\partial}{\partial x}\left(5\,x^2+\cos(2\,x)\right)^3$$

$$3\left(5\,x^2+\cos(2\,x)\right)^2\left(10\,x-2\,\sin(2\,x)\right)$$

ex5

```
> g(x):= sin(x)*cos(2*x):
> Diff(g(x),x); eval(diff(g(x),x));
```

$$\frac{\partial}{\partial x}\sin(x)\cos(2\,x)$$

$$\cos(x)\cos(2\,x)-2\,\sin(x)\sin(2\,x)$$

ex6

```
> g(x):= (tan(5*x^2-3*x))^4:
> Diff(g(x),x); eval(diff(g(x),x));
```

$$\frac{\partial}{\partial x}\tan(5\,x^2-3\,x)^4$$

$$4\tan(5\,x^2-3\,x)^3\left(1+\tan(5\,x^2-3\,x)^2\right)(10\,x-3)$$

ex 7

```
> f := y*x- y^2= 6;
> implicitdiff(f,y,x);

>
```

$$f := x\,y-y^2=6$$

$$-\frac{y}{x-2\,y}$$

Section III ex1

```
> f := x^2- y^2= 1;
  f1:=implicitdiff(f,y,x);f2:=implicitdiff(f1,y,x);
```

$$f := x^2-y^2=1$$

$$f1 := \frac{x}{y}$$

$$f2 := \frac{y}{x}$$

ex2

```
> g(x):= 2*cos(x) + (sin(x))^2:  Diff(g(x),x);
  g1(x):=eval(diff(g(x),x));Diff(g1(x),x);
  g2(x):=eval(diff(g1(x),x));
```

$$\frac{\partial}{\partial x}\left(2\cos(x)+\sin(x)^2\right)$$

$$g1(x) := -2\sin(x)+2\sin(x)\cos(x)$$

$$\frac{\partial}{\partial x}\left(-2\sin(x)+2\sin(x)\cos(x)\right)$$

$$g2(x) := -2\cos(x)+2\cos(x)^2-2\sin(x)^2$$

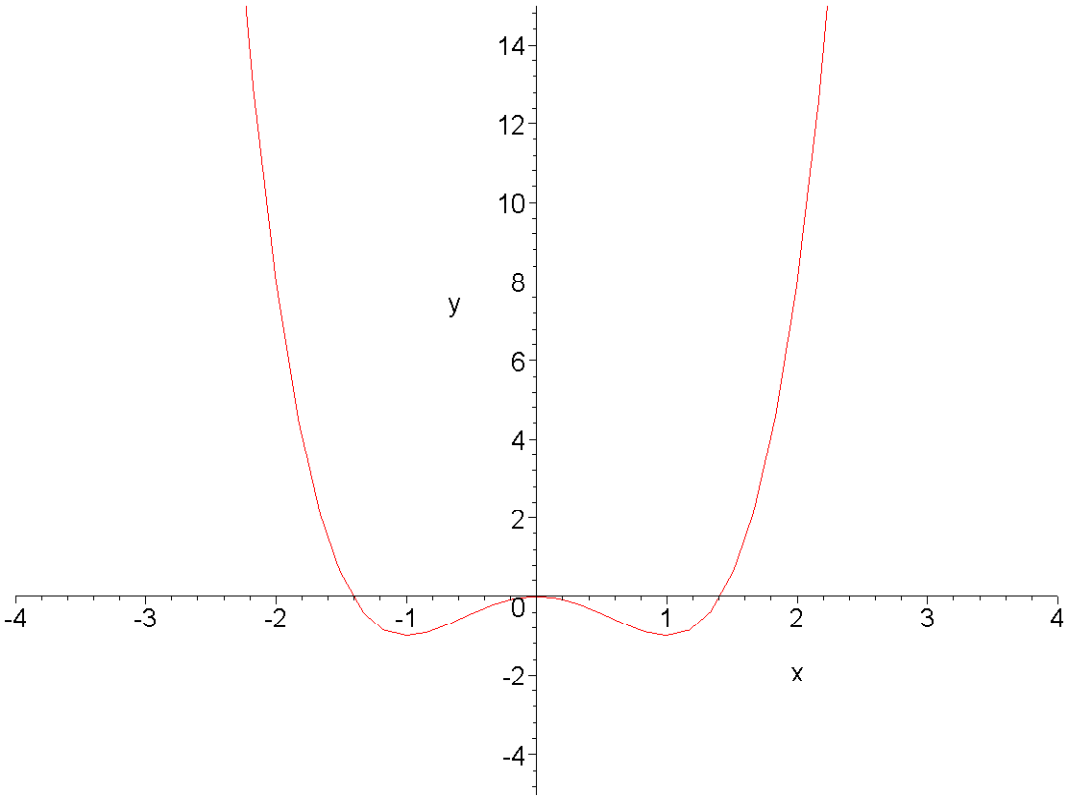
ex3 and 4 i skipped

Sec IV

ex1

```
> g(x):= x^4-2*x^2;plot(g(x),x=-4..4,y=-5..15,color= red);
>
```

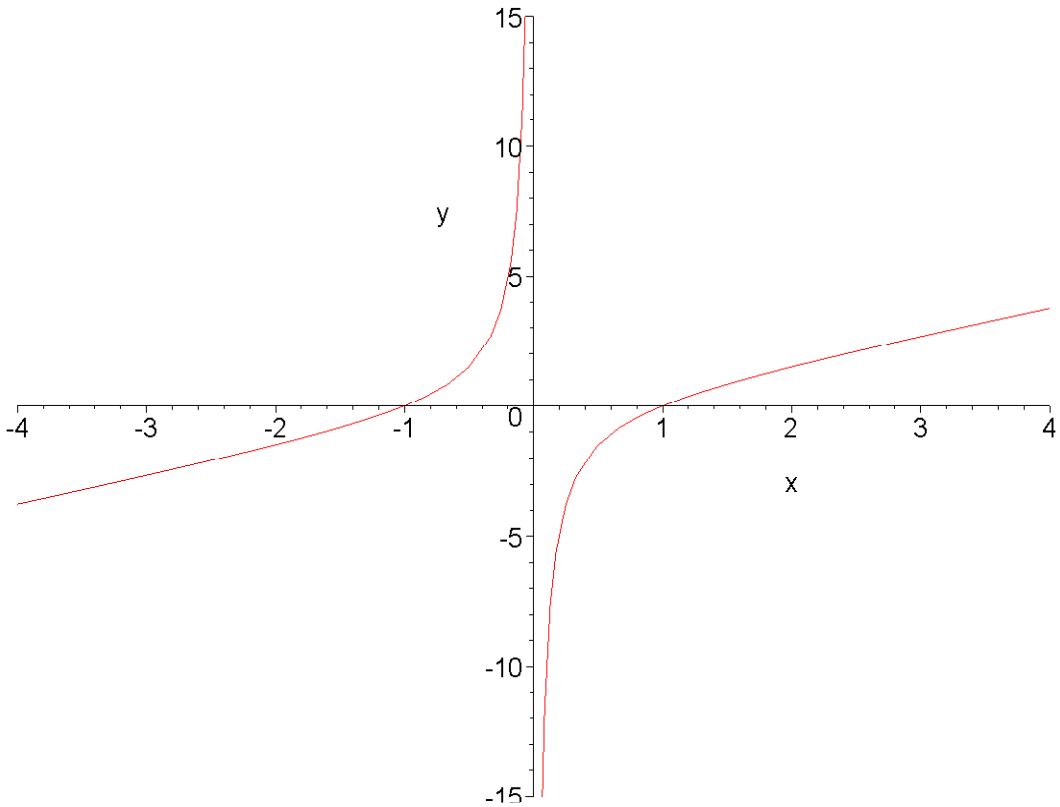
$$g(x) := x^4-2x^2$$



ex 2

```
> g(x):=(x^2-1)/x;plot(g(x),x=-4..4,y=-15..15,color= red);
>
```

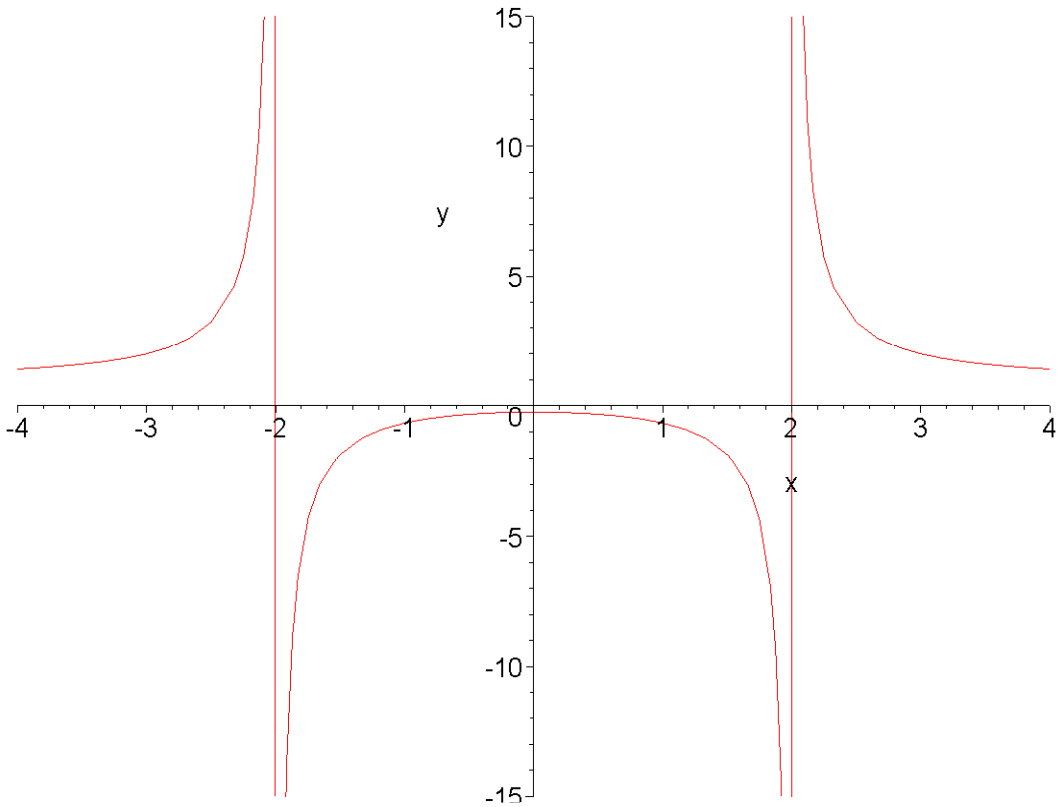
$$g(x) := \frac{x^2-1}{x}$$



ex 3

```
> g(x):=(x^2+1)/(x^2-4); plot(g(x),x=-4..4,y=-15..15,color= red);
>
```

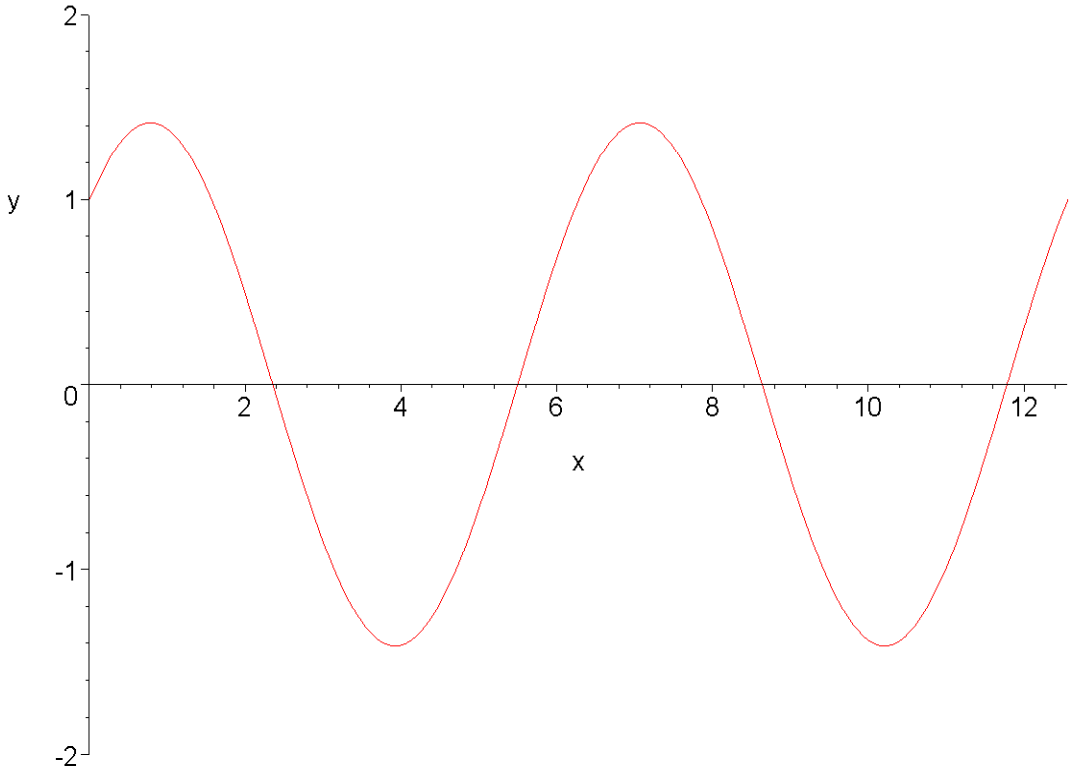
$$g(x) := \frac{x^2 + 1}{x^2 - 4}$$



ex4

```
> g(x):= cos(x) + sin(x);plot(g(x),x= 0 .. 4*Pi, y=-2..2);
```

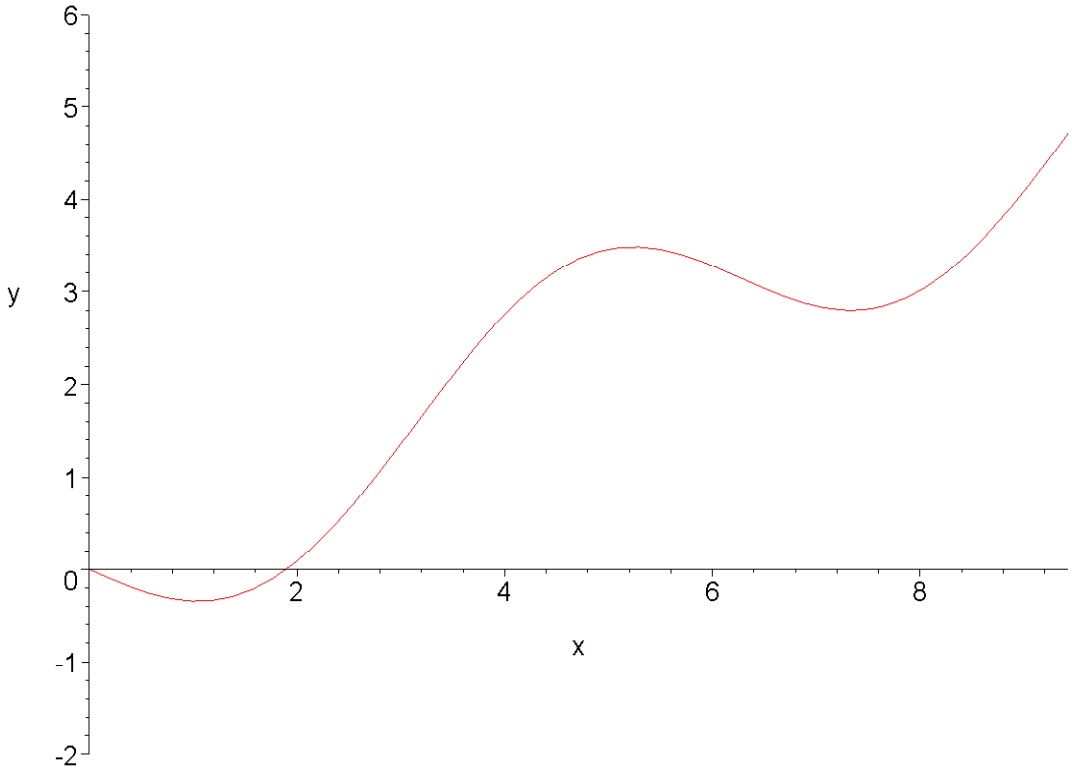
$$g(x) := \cos(x) + \sin(x)$$



ex5

```
> g(x):= x/2-sin(x);plot(g(x),x= 0 .. 3*Pi, y=-2..6);
>
```

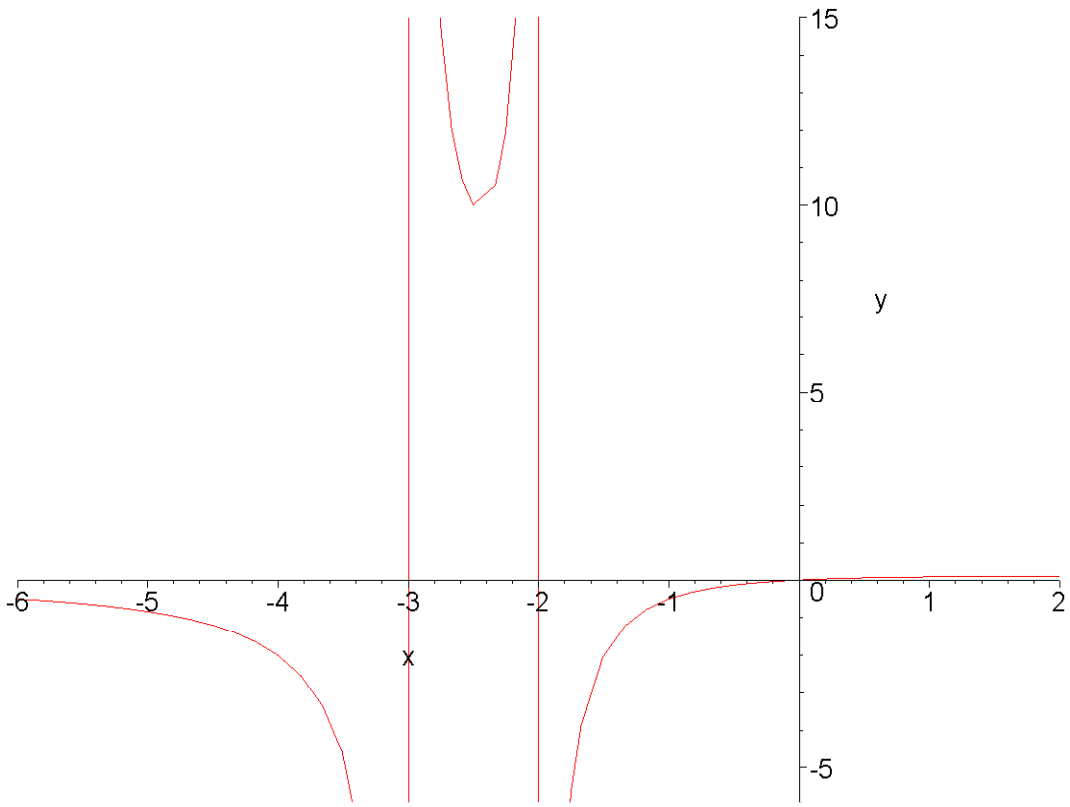
$$g(x) := \frac{1}{2}x - \sin(x)$$



ex 6

```
> g(x):= x/((x+2)*(x+3));
> plot(g(x),x= -6 .. 2, y=-6..15);
```

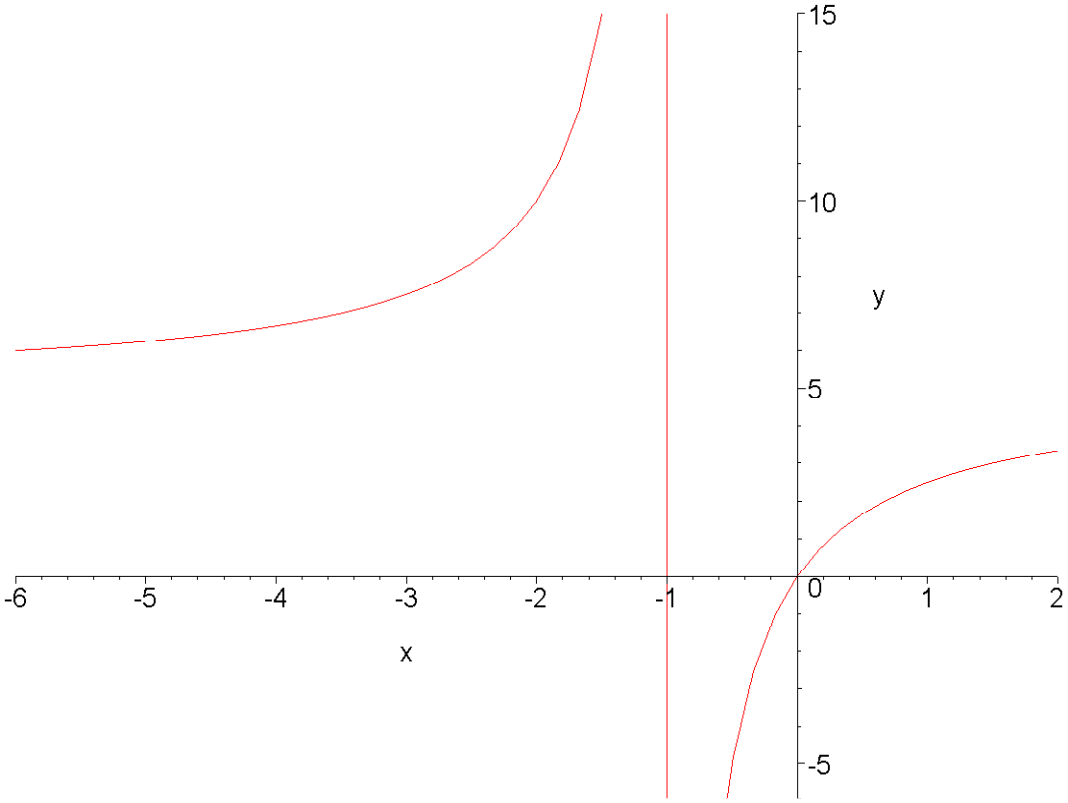
$$g(x) := \frac{x}{(x+2)(x+3)}$$



ex7

```
> g(x):= 5*x/(x+1);
> plot(g(x),x= -6 .. 2, y=-6..15);
>
```

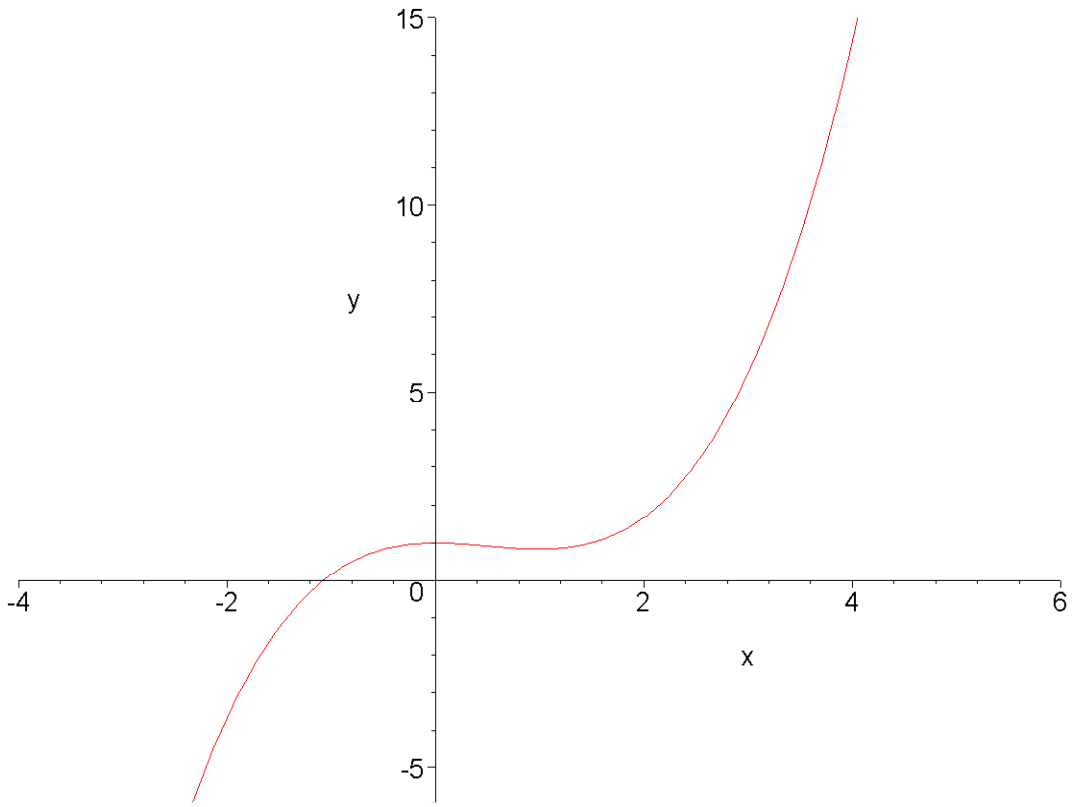
$$g(x) := 5\,\frac{x}{x+1}$$



ex 8

```
> g(x):= x^3/3-x^2/2+1;
> plot(g(x),x= -4 .. 6, y=-6..15);
```

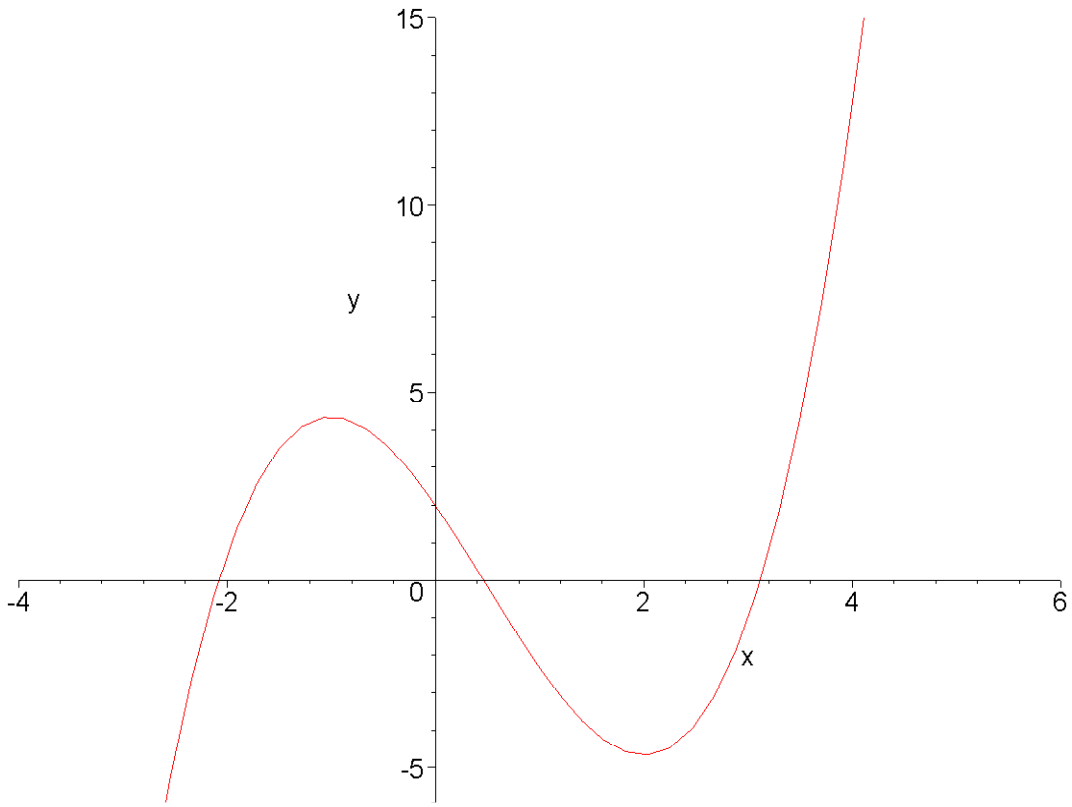
$$g(x) := \frac{1}{3}x^3 - \frac{1}{2}x^2 + 1$$



ex 9

```
> g(x):= 2*x^3/3-x^2-4*x+2;
> plot(g(x),x= -4 .. 6, y=-6..15);
>
```

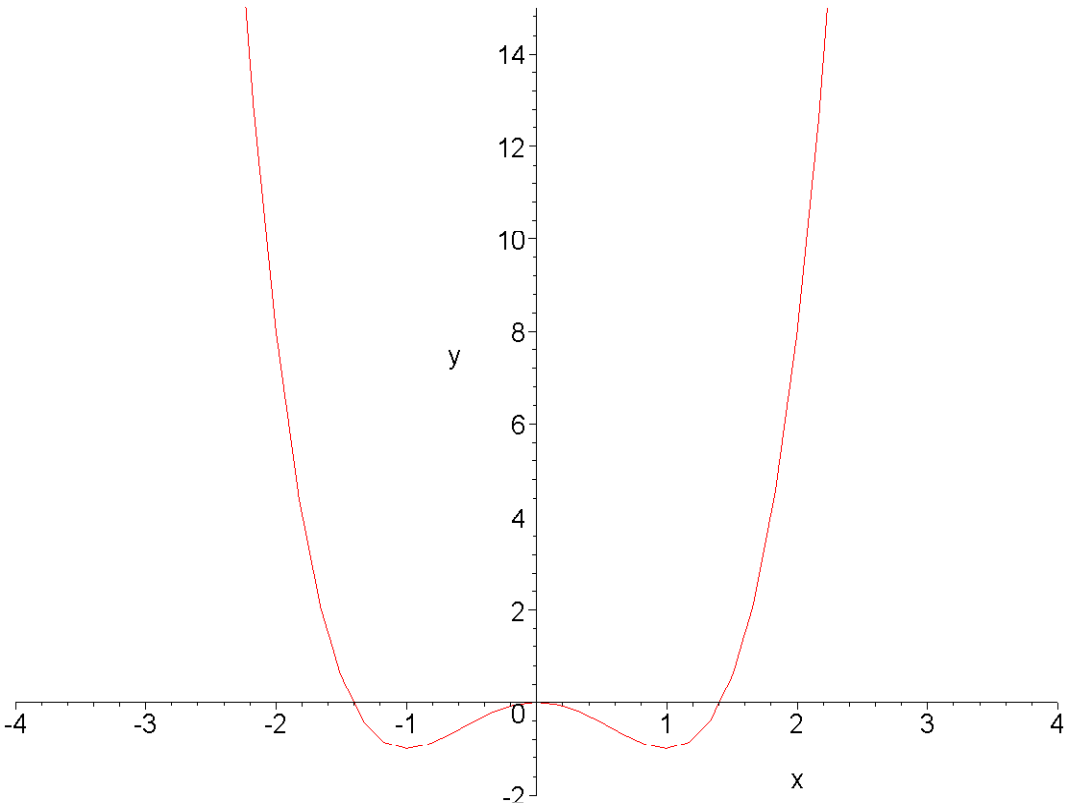
$$g(x) := \frac{2}{3}x^3 - x^2 - 4x + 2$$



ex10

```
> g(x):= x^4-2*x^2;
> plot(g(x),x= -4 .. 4, y=-2..15);
>
```

$$g(x) := x^4 - 2\,x^2$$


14
12
10
8
y
6
4
2
0
-2
-4
-3
-2
-1
1
2
3
4
x

>

>

>