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

Section I ex 1

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

$$\frac{\partial}{\partial x}\ln(\tan(x)) = \frac{1+\tan(x)^2}{\tan(x)}$$

ex 2

```
> g(x):= arctan(1+ sin(x)): Diff(g(x),x)= diff(g(x),x);
```

$$\frac{\partial}{\partial x}\arctan(1+\sin(x)) = \frac{\cos(x)}{1+(1+\sin(x))^2}$$

ex 3

```
> g(x):= exp(1+(x^2)): Diff(g(x),x)= diff(g(x),x);
```

$$\frac{\partial}{\partial x}\mathbf{e}^{(1+x^2)} = 2\,x\,\mathbf{e}^{(1+x^2)}$$

ex 4

```
> g(x):= arcsin(x)*exp(x)/sin(x): Diff(g(x),x)=
  diff(g(x),x):simplify(%);
>
```

$$\frac{\partial}{\partial x}\frac{\arcsin(x)\,\mathbf{e}^{x}}{\sin(x)} = \frac{\mathbf{e}^{x}\,(-\sin(x)-\arcsin(x)\sqrt{1-x^2}\,\sin(x)+\arcsin(x)\cos(x)\sqrt{1-x^2})}{\sqrt{1-x^2}\,(-1+\cos(x)^2)}$$

ex 5

```
> g(x):= x^ln(x): Diff(g(x),x)= diff(g(x),x):g1:=simplify(%);
```

$$g1 := \frac{\partial}{\partial x}\mathbf{e}^{(\ln(x)^2)} = 2\,\frac{\mathbf{e}^{(\ln(x)^2)}\ln(x)}{x}$$

Section II

ex 1

```
> g:= x -> 1/sqrt(4-x^2):
  Int(g(x),x)= int(g(x),x);
```

$$\int \frac{1}{\sqrt{4-x^2}}\,dx = \arcsin\left(\frac{1}{2}x\right)$$

$$\int \sec(x)+\sin(x)^2\,dx = \ln(\sec(x)+\tan(x)) - \frac{1}{2}\cos(x)\sin(x) + \frac{1}{2}x$$

ex 2

```
> g:= x -> x/(9+x^2):
  Int(g(x),x)= int(g(x),x): simplify(%);
```

$$\int \frac{x}{9+x^2}\,dx = \frac{1}{2}\ln(9+x^2)$$

```
>
```

ex3

```
> g:= x -> 1/(x^2+9):
  Int(g(x),x)= int(g(x),x);
```

$$\int \frac{1}{9+x^2}\,dx = \frac{1}{3}\arctan\left(\frac{1}{3}x\right)$$

ex 4

```
> g:= x -> x/sqrt(4-x^2):Int(g(x),x)= int(g(x),x);
```

$$\int \frac{x}{\sqrt{4-x^2}}\,dx = -\sqrt{4-x^2}$$

ex 5

```
> g:= x -> (ln(x))^2/x:
  Int(g(x),x)= int(g(x),x);
```

$$\int \frac{\ln(x)^2}{x}\,dx = \frac{1}{3}\ln(x)^3$$

ex 6

```
> g:= x -> exp(-sqrt(x))/sqrt(x):
  Int(g(x),x)= int(g(x),x):simplify(%);
```

$$\int \frac{e^{(-\sqrt{x})}}{\sqrt{x}}\,dx = -2\,e^{(-\sqrt{x})}$$

ex 7

```
> g:= x -> exp(tan(x))/(cos(x))^2:
  (Int(g(x),x))= exp(tan(x)) ;
```

$$\int \frac{e^{\tan(x)}}{\cos(x)^2}\,dx = e^{\tan(x)}$$

ex 8

```
> g:= x -> (ln(x)):
  Int(g(x),x)= int(g(x),x);
```

$$\int \ln(x)\,dx = x\ln(x) - x$$

ex 9

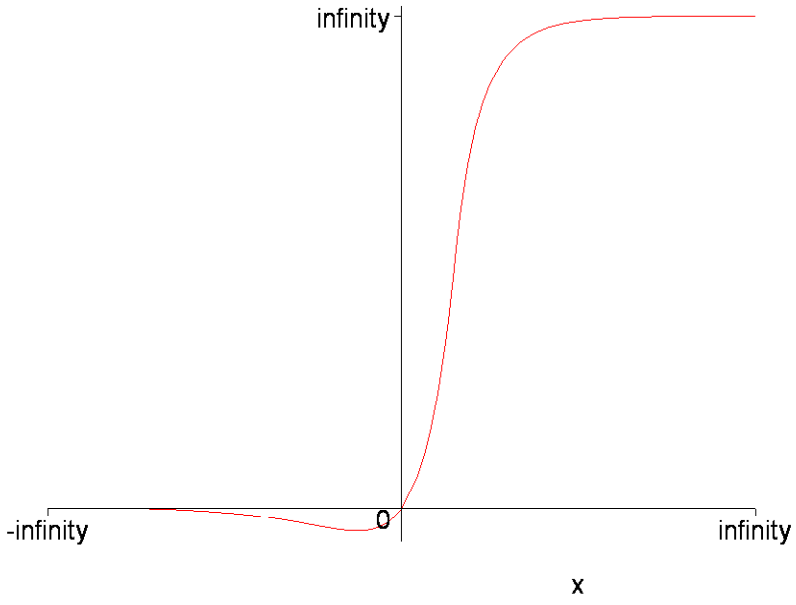
```
> g:= x -> x*sin(x):
  Int(g(x),x)= int(g(x),x);
```

$$\int x\sin(x)\,dx = \sin(x) - x\cos(x)$$

Section III ex1

```
> g(x) := x *exp(x);plot(g(x),x=-infinity .. infinity);
```

$$g(x) := x\,e^{x}$$

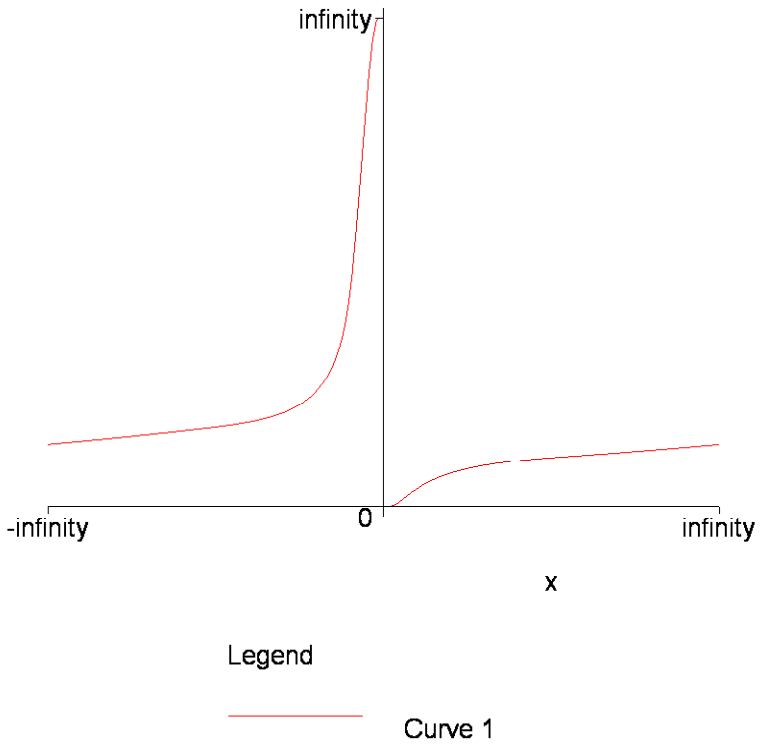


>

ex2

```
> g(x) := exp(-1/x);plot(g(x),x=-infinity..infinity);
```

$$g(x) := e^{\left(-\frac{1}{x}\right)}$$




```
> 
```

Section IV

ex1

```
> g(x):= (cos(4*x)-1)/x;
```

$$g(x) := \frac{\cos(4x) - 1}{x}$$

```
> Limit(g(x), x=0)=limit(g(x), x=0);
```

$$\lim_{x \to 0} \frac{\cos(4x) - 1}{x} = 0$$

ex2

```
> g(x):= (1 -x)^(1/x);
```

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

```
> Limit(g(x), x=0, right)=limit(g(x), x=0, right);
```

$$\lim_{x \to 0+} (1 - x)^{\left(\frac{1}{x}\right)} = \mathbf{e}^{(-1)}$$

ex3

```
> g(x):= x*exp(1/x)-x;
```

$$g(x) := x\,\mathbf{e}^{\left(\frac{1}{x}\right)} - x$$

```
> Limit(g(x), x= infinity)=limit(g(x), x=infinity);
```

$$\lim_{x \to \infty} x\, \mathbf{e}^{\left(\frac{1}{x}\right)} - x = 1$$

ex4

```
> g(x):= x*exp(-x);
```

$$g(x) := x\, \mathbf{e}^{(-x)}$$

```
> Limit(g(x), x= infinity)=limit(g(x), x=infinity);
```

$$\lim_{x \to \infty} x\, \mathbf{e}^{(-x)} = 0$$

Sec V

ex2

```
> sin(arctan(1));
>
```

$$\frac{1}{2}\sqrt{2}$$

ex 3

```
> tan(arcsin(1/2));
```

$$\frac{1}{3}\sqrt{3}$$

>