```
> #TP 1 Maple
> #Exo 1:
> restart;
> assume(n,integer);
> u:=sin(n*Pi);
```

$$u := 0 \tag{1}$$

```
> v:=cos(Pi/2+n*Pi);
```

$$v := 0 \tag{2}$$

```
> w:=tan(n*Pi);
```

$$w := 0 \tag{3}$$

```
> x:=sin(Pi/2+n*Pi);
```

$$x := (-1)^{n\sim} \tag{4}$$

```
> y:=cos(n*Pi);
```

$$y := (-1)^{n\sim} \tag{5}$$

```
> #Exo 2 :
> limit((ln (n))^5/n^3,n=infinity);
```

$$0 \tag{6}$$

```
> limit(n^6/exp(n^2),n=infinity);
```

$$0 \tag{7}$$

```
> limit(exp(n^8)/(n!),n=infinity);
```

$$\infty \tag{8}$$

```
> limit(n!/n^n,n=infinity);
```

$$0 \tag{9}$$

```
> #Exo 3 :
> restart;
> limit((3*n^2+1)/(-5*n^2+6*n-6),n=infinity);
```

$$\frac{-3}{5} \tag{10}$$

```
> limit((4*n^3+9*n)/(2*n^2+7),n=infinity);
```

$$\infty \tag{11}$$

```
> limit((n^2+n+1)/(-6*n^3+4*n),n=infinity);
```

$$0 \tag{12}$$

```
> #Exo 4 :
> limit(n*((1+1/n)^(alpha)-1),n=infinity);
```

$$\alpha \tag{13}$$

```
> #Exo 5 :
> #Q1 :
```

```
> u:=n!;
```
$$u := n! \qquad (14)$$

```
> v:=sqrt(n)*(n^n)*exp(-n);
```
$$v := \sqrt{n}\; n^n \, \mathrm{e}^{(-n)} \qquad (15)$$

```
> limit(u/v,n=infinity);
```
$$\sqrt{2}\,\sqrt{\pi} \qquad (16)$$

```
> u1:=%*v;
```
$$u1 := \sqrt{2}\,\sqrt{\pi}\,\sqrt{n}\; n^n \, \mathrm{e}^{(-n)} \qquad (17)$$

```
> #Q. 2 :
> w:=(1/sqrt(n))*(n^n)*exp(-n);
```
$$w := \frac{n^n \, \mathrm{e}^{(-n)}}{\sqrt{n}} \qquad (18)$$

```
> limit((u-u1)/w,n=infinity);
```
$$\frac{1}{12}\sqrt{2}\,\sqrt{\pi} \qquad (19)$$

```
> u2:=u1+%*w;
```
$$u2 := \sqrt{2}\,\sqrt{\pi}\,\sqrt{n}\; n^n \, \mathrm{e}^{(-n)} + \frac{1}{12}\,\frac{\sqrt{2}\,\sqrt{\pi}\; n^n \, \mathrm{e}^{(-n)}}{\sqrt{n}} \qquad (20)$$

```
> #Q 3 :
> series(u,n=infinity, 2);
```
$$\frac{\dfrac{\sqrt{2}\,\sqrt{\pi}}{\sqrt{\frac{1}{n}}} + \dfrac{1}{12}\sqrt{2}\,\sqrt{\pi}\,\sqrt{\frac{1}{n}} + \mathrm{O}\left(\left(\frac{1}{n}\right)^{(3/2)}\right)}{\left(\frac{1}{n}\right)^n \mathrm{e}^n} \qquad (21)$$

```
> #Exo 6 :
> restart;
> u:=u0+n*r;
```
$$u := u0 + n\, r \qquad (22)$$

```
> assume(r>0);
> limit(u,n=infinity);
```
$$\infty \qquad (23)$$

```
> assume(r<0);
> limit(u,n=infinity);
```
$$-\infty \qquad (24)$$

```
> assume(r=0);
```

```
> limit (u,n=infinity);
```

$$0 \qquad (25)$$

```
> r:='r';
```

$$r := r \qquad (26)$$

```
> factor(sum(u,n=0..N));
```

$$\frac{1}{2}\,(N+1)\,(r\,N+2\,u0) \qquad (27)$$

```
> #Exo 7 :
```

> # 1

> $Sum(k, k=0..n) = sum(k, k=0..n);$

$$\sum_{k=0}^{n} k = \frac{1}{2}\,(n+1)^2 - \frac{1}{2}\,n - \frac{1}{2} \qquad (28)$$

> $factor(\%);$

$$\sum_{k=0}^{n} k = \frac{1}{2}\,n\,(n+1) \qquad (29)$$

> # 2

> $Sum(k, k=0..n) = factor\left(sum\left(k^2\ ,\ k=0..n\right)\right);$

$$\sum_{k=0}^{n} k = \frac{1}{6}\,n\,(n+1)\,(2\,n+1) \qquad (30)$$

> # 3

> $Sum\left(k^3, k=0..n\right) = factor\left(sum\left(k^3, k=0..n\right)\right);$

$$\sum_{k=0}^{n} k^3 = \frac{1}{4}\,n^2\,(n+1)^2 \qquad (31)$$

> # 4
> $Sum\left(k^4, k=0..n\right) = factor\left(sum\left(k^4, k=0..n\right)\right);$

$$\sum_{k=0}^{n} k^4 = \frac{1}{30}\,n\,(2\,n+1)\,(n+1)\left(3\,n^2+3\,n-1\right) \qquad (32)$$

> # 5
> $Sum\left(a\cdot k^3 + b\cdot k^2 + c\cdot k + d, k=0..n\right) = factor(sum(a*k\hat{}3 + b*k\hat{}2 + c*k$
> $+ d, k=0..n));$

$$\sum_{k=0}^{n}\left(a\,k^3+b\,k^2+c\,k+d\right) = \frac{1}{12}\,(n+1)\left(3\,a\,n^3+3\,a\,n^2+4\,b\,n^2+2\,b\,n+6\,c\,n+12\,d\right) \qquad (33)$$

> # Exo 8 :
> # 1
> $u := u0\cdot q^n;$

$$u := u0\,q\sim^n \qquad (34)$$

> $assume(q > 1);$

> $limit(u, n = infinity);$

$$\mathrm{signum}(u0)\ \infty \tag{35}$$

> $assume(q < -1);$

> $limit(u, n = infinity);$

$$\mathrm{signum}(u0)\ \infty \tag{36}$$

> $assume(q < 1 \quad and \quad -1 > q);$

> $limit(u, n = infinity);$

$$\mathrm{signum}(u0)\ \infty \tag{37}$$

>

> # 2

> $q :='q';$

$$q := q \tag{38}$$

> $S := factor(sum(u, n = 0 ..N));$

$$S := \frac{u0\left(q\sim^{(N+1)} - 1\right)}{q\sim - 1} \tag{39}$$

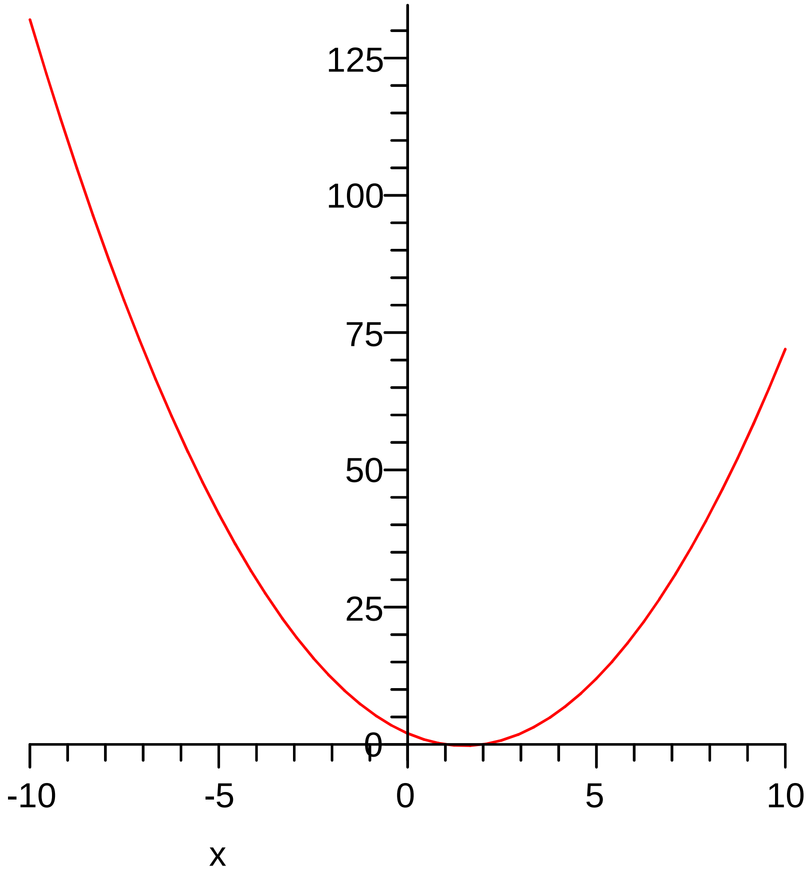
> # EXO 9

> # 1

> $f := x \rightarrow x^2 \quad - 3 \cdot x + 2;$

$$f := x \rightarrow x^2 - 3\,x + 2 \tag{40}$$

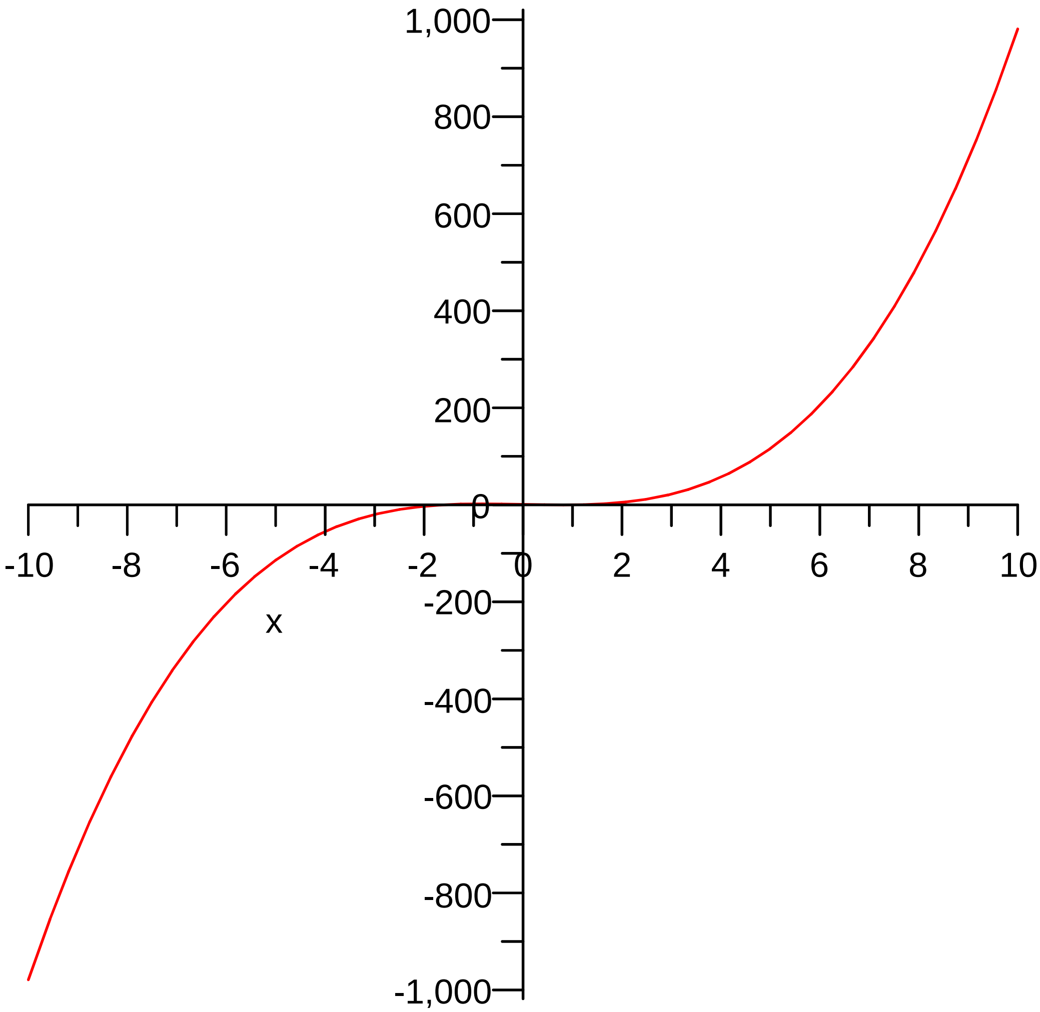
> $plot(f(x), x);$



> $g := x \rightarrow x^3 - 3 \cdot x + x + 1;$

$$g := x \rightarrow x^3 - 2\,x + 1 \tag{41}$$

> $plot(g(x), x);$



> # 2

> $F := proc(x, n)$
> $if\ \ (x = 0)\ \ then\ \ return\ \ n;$
> $else\ \ return\ \ n \cdot \left(\frac{sin(x)}{x}\right);$
> $end\ \ if;$
> $end\ \ proc;$

$$F := \textbf{proc}(x, n)\ \textbf{if}\ x = 0\ \textbf{then return}\ n\ \textbf{else return}\ (n * \sin(x)) / x\ \textbf{end if end proc} \tag{42}$$

> $F(0, 3);$

$$3 \tag{43}$$

> $F(Pi, 4);$

$$0 \tag{44}$$

> $f := x \rightarrow F(x, 13);$

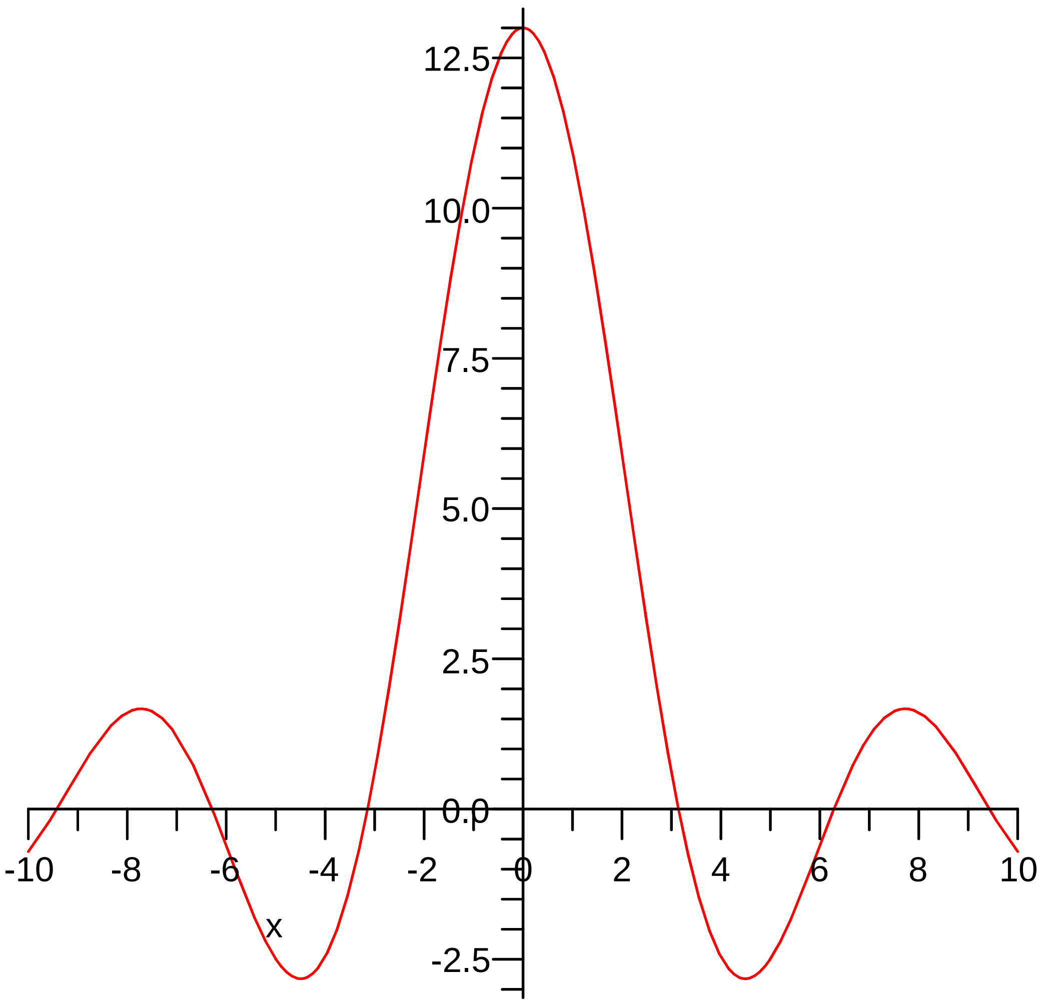
$$f := x \rightarrow F(x, 13) \tag{45}$$

> $f(3);$

(46)

$$\frac{13}{3}\sin(3) \quad (46)$$

> $plot(f(x), x = -10..10);$



> \# 4
> $restart;$

> $l := t \cdot exp(x) + x^2;$

$$l := t\,\mathrm{e}^x + x^2 \quad (47)$$

> $L := x \rightarrow l;$

$$L := x \rightarrow l \quad (48)$$

> $L(x);$

$$t\,\mathrm{e}^x + x^2 \quad (49)$$

> $L1 := x \rightarrow -exp(x) + x^2; L2 := x \rightarrow exp(x) + x^2;\; L3 := x^2;$

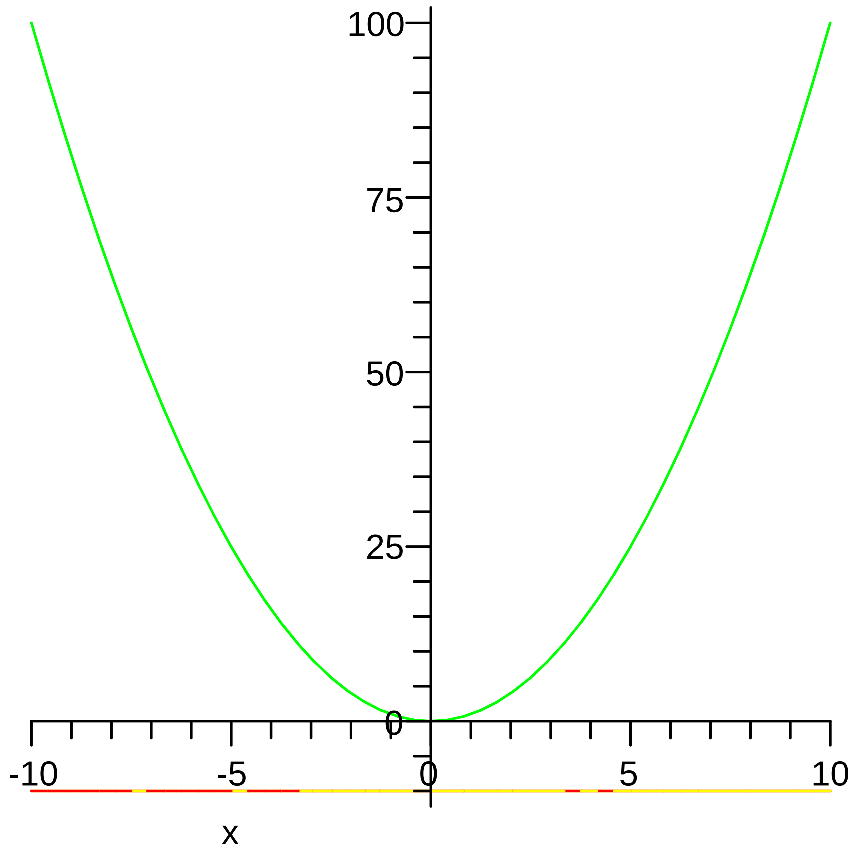
$$L1 := x \rightarrow -exp(x) + x^2$$

$$L2 := x \rightarrow \mathrm{e}^x + x^2$$

(50)

$$L3 := x^2 \tag{50}$$

> $plot(\{L1, L2, L3\}, x);$



> $\# EXO \quad 10$

> $\# \; 1$

> $u := 2; u;$

$$u := 2$$

$$2 \tag{51}$$

> $u + 2;$

$$4 \tag{52}$$

> $u \cdot 3;$

$$6 \tag{53}$$

> $abs(u - 5) \cdot u;$

$$6 \tag{54}$$

> $sqrt\left(u^{(-2)} + 1\right);$

$$\frac{1}{2}\sqrt{5} \tag{55}$$

> \# Q 2

> restart;

> $x := 5;\ x;$

$$x := 5$$

$$5 \tag{56}$$

> $x :='x';$

$$x := x \tag{57}$$

> $x;$

$$x \tag{58}$$

> \# Q 3

> $P := 3 \cdot x^4 + 5 \cdot x^3 - 2 \cdot x + 2;$

$$P := 3\,x^4 + 5\,x^3 - 2\,x + 2 \tag{59}$$

> $x := 2;$

$$x := 2 \tag{60}$$

> $P;$

$$86 \tag{61}$$

> $x :='x';$
> $subs(x = 100, P);$

$$x := x$$

$$304999802 \tag{62}$$

> $subs(x = -1, P);$

$$2 \tag{63}$$

> $subs(x = -43, P);$

$$9858956 \tag{64}$$

> $P;$

$$3\,x^4 + 5\,x^3 - 2\,x + 2 \tag{65}$$

> \# Q4

> $x := y^2;$

$$x := y^2 \tag{66}$$

> $eval(P, 1);$

$$3\,x^4 + 5\,x^3 - 2\,x + 2 \tag{67}$$

> $eval(P, 2);$

$$3\,y^8 + 5\,y^6 - 2\,y^2 + 2 \tag{68}$$

> \# Q5

> restart;

$Q := (x - 1.2) \cdot (x - 3.65);$

$$Q := (x - 1.2)\,(x - 3.65) \tag{69}$$

> $expand(Q);$

$$x^2 - 4.85\,x + 4.380 \tag{70}$$

> \# Q6

> $expand(\cos(3 \cdot x));$

$$4\cos(x)^3 - 3\cos(x) \tag{71}$$

> $expand(\tan(3 \cdot x));$

$$\frac{3\tan(x) - \tan(x)^3}{1 - 3\tan(x)^2} \tag{72}$$

> $simplify\left(expand\left((\cos(x) + \sin(x))^2\right)\right);$

$$2\cos(x)\sin(x) + 1 \tag{73}$$

> \#Q7

> $\ln(expand((x + 1) \cdot (x - 1)));$

$$\ln\left(x^2 - 1\right) \tag{74}$$

>