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

$$u := 0$$

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

$$v := 0$$

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

$$w := 0$$

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

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

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

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

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

$$0$$

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

$$0$$

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

$$\infty$$

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

$$0$$

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

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

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

$$\infty$$

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

$$0$$

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

$$\alpha$$

```
> #Exo 5 :
> #Q1 :
> u:=n!;
```

$$u := n!$$

```
> v:=sqrt(n)*(n^n)*exp(-n);
```

$$v := \sqrt{n}\, n^n\, \mathbf{e}^{(-n)}$$

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

$$\sqrt{2}\,\sqrt{\pi}$$

```
> u1:=%*v;
```

$$u1 := \sqrt{2}\,\sqrt{\pi}\,\sqrt{n}\,n^n\,\mathbf{e}^{(-n)}$$

```
> #Q. 2 :
> w:=(1/sqrt(n))*(n^n)*exp(-n);
```

$$w := \frac{n^n\,\mathbf{e}^{(-n)}}{\sqrt{n}}$$

```
> limit((u-u1)/w,n=infinity);
```

$$\frac{\sqrt{2}\,\sqrt{\pi}}{12}$$

```
> u2:=u1+%*w;
```

$$u2 := \sqrt{2}\,\sqrt{\pi}\,\sqrt{n}\,n^n\,\mathbf{e}^{(-n)} + \frac{1}{12}\,\frac{\sqrt{2}\,\sqrt{\pi}\,n^n\,\mathbf{e}^{(-n)}}{\sqrt{n}}$$

```
> #Q 3 :
> series(u,n=infinity, 2);
```

$$\frac{\dfrac{\sqrt{2}\,\sqrt{\pi}}{\sqrt{\dfrac{1}{n}}} + \dfrac{\sqrt{2}\,\sqrt{\pi}\,\sqrt{\dfrac{1}{n}}}{12} + O\left(\left(\frac{1}{n}\right)^{(3/2)}\right)}{\left(\dfrac{1}{n}\right)^n\,\mathbf{e}^n}$$

```
> #Exo 6 :
> restart;
> u:=u0+n*r;
```

$$u := u0 + n\,r$$

```
> assume(r>0);
> limit(u,n=infinity);
```

$$\infty$$

```
> assume(r<0);
> limit(u,n=infinity);
```

$$-\infty$$

```
> assume(r=0);
> limit (u,n=infinity);
```

$$0$$

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

$$r := r$$

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

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

```
>
```