```
> restart;
```

```
> interface(warnlevel = 0) :          #   Maple 12
```

Taylor Series of various function using Maples' taylor() function.

taylor(expression, expansion point, [expansion order])

```
> taylor(sin(x), x = 0, 8);
```
$$x - \frac{1}{6} x^3 + \frac{1}{120} x^5 - \frac{1}{5040} x^7 + \mathrm{O}(x^8) \tag{1}$$

```
> taylor(cos(x), x = 0, 8);
```
$$1 - \frac{1}{2} x^2 + \frac{1}{24} x^4 - \frac{1}{720} x^6 + \mathrm{O}(x^8) \tag{2}$$

```
> taylor(e^x, x = 0);
```
$$1 + x + \frac{1}{2} x^2 + \frac{1}{6} x^3 + \frac{1}{24} x^4 + \frac{1}{120} x^5 + \mathrm{O}(x^6) \tag{3}$$

```
> taylor(e^{-x}, x = 0);
```
$$1 - x + \frac{1}{2} x^2 - \frac{1}{6} x^3 + \frac{1}{24} x^4 - \frac{1}{120} x^5 + \mathrm{O}(x^6) \tag{4}$$

```
> taylor( 2·arcsin( 1/√N ), N = ∞);
```
$$2 \sqrt{\frac{1}{N}} + \frac{1}{3} \left(\frac{1}{N} \right)^{3/2} + \frac{3}{20} \left(\frac{1}{N} \right)^{5/2} + \frac{5}{56} \left(\frac{1}{N} \right)^{7/2} + \frac{35}{576} \left(\frac{1}{N} \right)^{9/2} + \frac{63}{1408} \left(\frac{1}{N} \right)^{11/2} + \mathrm{O}\left(\frac{1}{N^6} \right) \tag{5}$$

```
> taylor( 2·arcsin( 1/√N ), N = ∞, 1 );
```
$$2 \sqrt{\frac{1}{N}} + \mathrm{O}\left(\frac{1}{N} \right) \tag{6}$$

```
> taylor( 2·arccos( √(N-1)/√N ), N = ∞);
```
$$2 \sqrt{\frac{1}{N}} + \frac{1}{3} \left(\frac{1}{N} \right)^{3/2} + \frac{3}{20} \left(\frac{1}{N} \right)^{5/2} + \frac{5}{56} \left(\frac{1}{N} \right)^{7/2} + \frac{35}{576} \left(\frac{1}{N} \right)^{9/2} + \mathrm{O}\left(\left(\frac{1}{N} \right)^{11/2} \right) \tag{7}$$

Limits

```
> R := limit_{N → ∞} ( 1 + θ/N · M )^N;
  R := limit_{N → ∞} ( 1 - I · θ/(2 N) · M )^N;
```
$$R := e^{\theta M}$$
$$R := e^{-\frac{1}{2} I \theta M} \tag{8}$$