Fourier Series

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- **Some of the examples are taken from "Guide to Standard Mathematica Packages", Version 2.2, Wolfram Research.**

```
<< "Calculus`FourierTransform`"
```

```
? Fourier*
```

```
Fourier                    FourierOverallConstant
FourierCosSeriesCoefficient FourierSample
FourierCosTransform        FourierSinSeriesCoefficient
FourierExpSeries           FourierSinTransform
FourierExpSeriesCoefficient FourierTransform
FourierFrequencyConstant   FourierTrigSeries
```

```
? FourierTrigSeries
```

```
FourierTrigSeries[expr, {x, x0, x1}, n] gives the trigonometric series expansion of expr to order n.
```

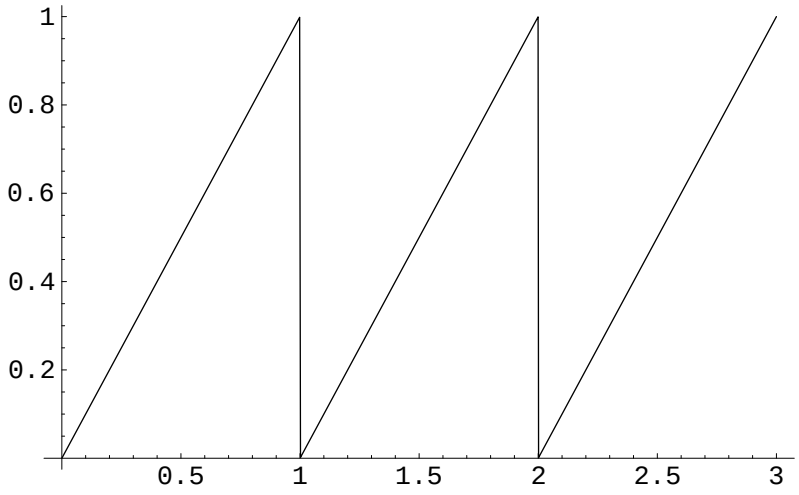
Function expr is taken on interval x0 to x1.

- **Example: Fourier Trig Series for function x on interval 0 < x < 1. Take as periodic.**

```
? Floor
```

```
Floor[x] gives the greatest integer less than or equal to x.
```

```
frplt = Plot[x - Floor[x], {x, 0, 3}]
```

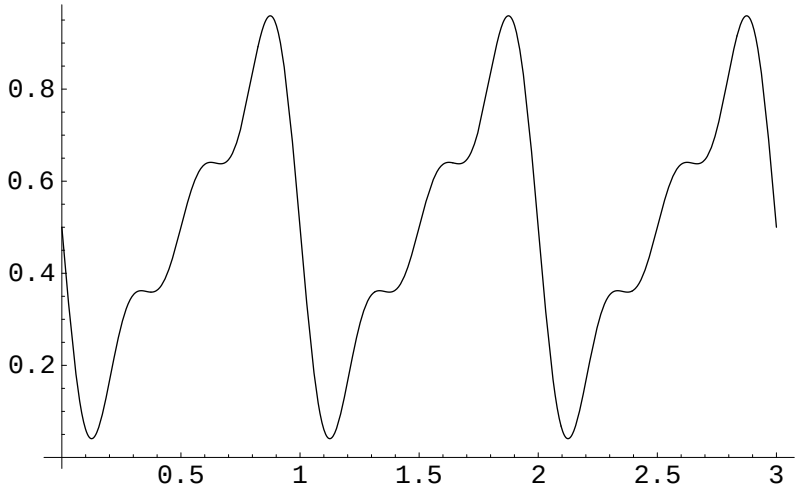


- Graphics -

```
fpx = FourierTrigSeries[x, {x, 0, 1}, 3]
```

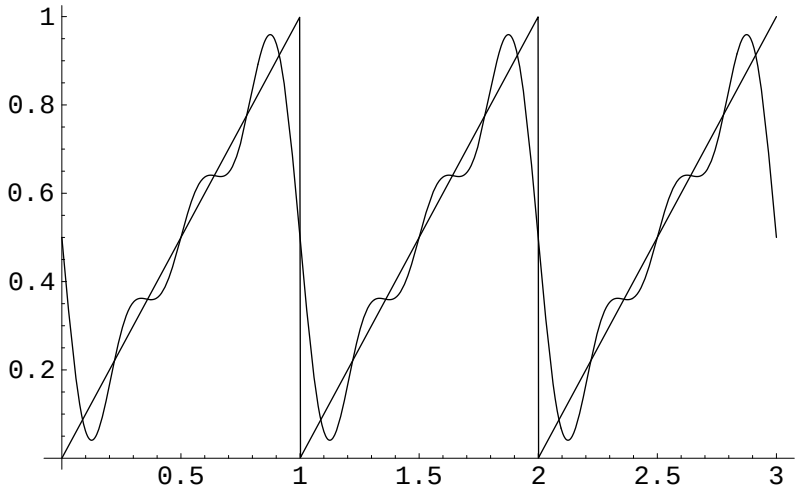
$$\frac{1}{2} - \frac{\text{Sin}[2\,\pi\,x]}{\pi} - \frac{\text{Sin}[4\,\pi\,x]}{2\,\pi} - \frac{\text{Sin}[6\,\pi\,x]}{3\,\pi}$$

```
fpxplot = Plot[fpx, {x, 0, 3}]
```



- Graphics -

```
Show[frplt, fpxplot]
```




```
- Graphics -
```

```
n := 6
```

```
FourierCosSeriesCoefficient[Cos[k x], {x, -π, π}, n]
```

$$\frac{2\,k\,\text{Sin}[k\,\pi]}{(-6+k)\,(6+k)\,\pi}$$