

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.
```

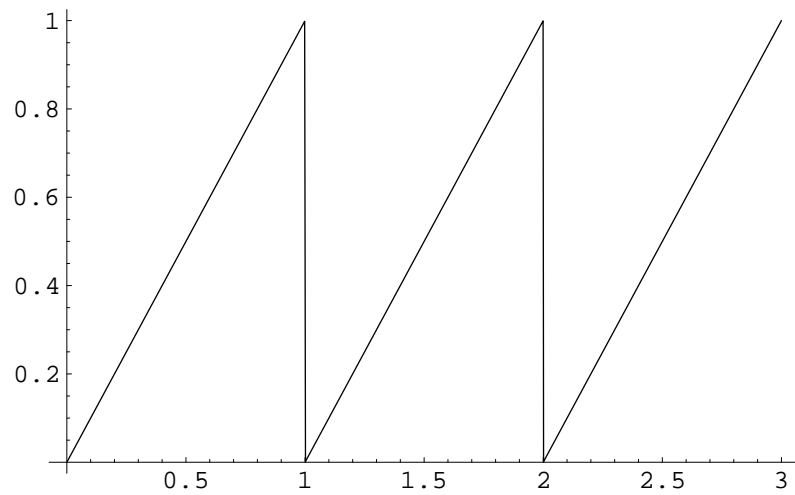
Function expr is taken on interval x_0 to x_1 .

- **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}]
```

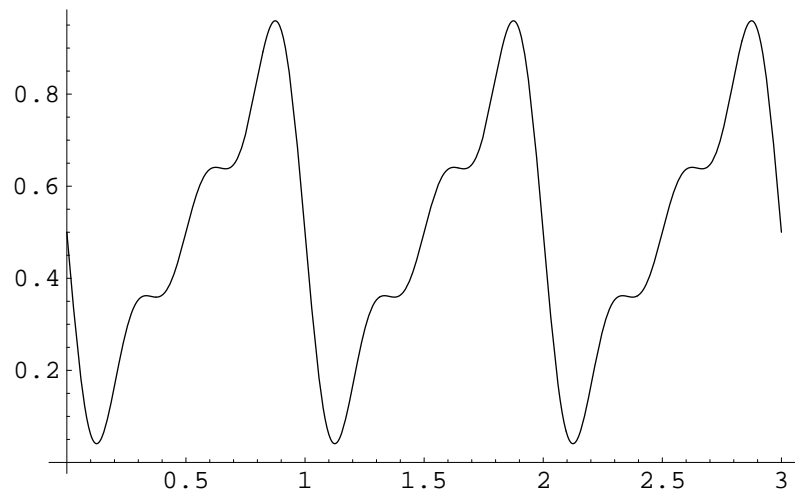


- Graphics -

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

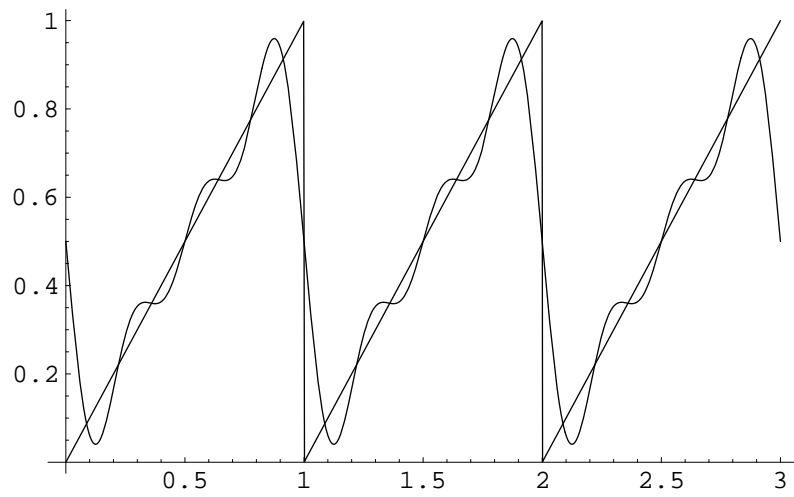
$$\frac{1}{2} - \frac{\text{Sin}[2\pi x]}{\pi} - \frac{\text{Sin}[4\pi x]}{2\pi} - \frac{\text{Sin}[6\pi x]}{3\pi}$$

```
fpplot = Plot[fp, {x, 0, 3}]
```



- Graphics -

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



```
- Graphics -
```

```
n := 6
```

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

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