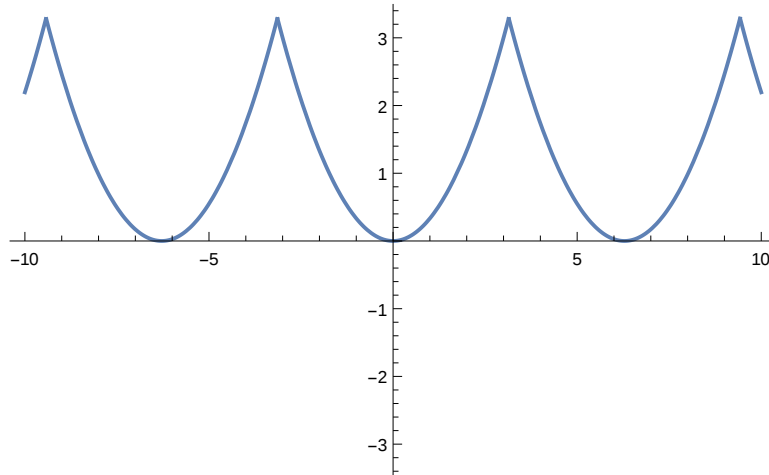


```
f[t_] := t^2 / 3;
```

```
g[u_] := f[Pi Mod[(u + Pi) / Pi, 2] - Pi];
```

```
Plot[g[u], {u, -10, 10}, PlotStyle -> Thick, PlotRange -> 3.5, ImageSize -> 400]
```



```
(* Długość rozwinięcia *)
```

```
max = 10;
```

```
(* Iloczyn skalarny w przestrzeni funkcji o okresie 2π *)
```

```
φ[x_, y_] := Integrate[xy, {t, -π, π}]
```

```
(* Wyraz stały *)
```

```
a = φ[f[t], 1] / (2 π)
```

$$\frac{\pi^2}{9}$$

```
(* Współczynniki przy cosinusach *)
```

```
b = Table[φ[f[t], Cos[k t]] / Pi, {k, 1, max}]
```

$$\left\{ -\frac{4}{3}, \frac{1}{3}, -\frac{4}{27}, \frac{1}{12}, -\frac{4}{75}, \frac{1}{27}, -\frac{4}{147}, \frac{1}{48}, -\frac{4}{243}, \frac{1}{75} \right\}$$

```
(* Współczynniki przy sinusach *)
```

```
c = Table[φ[f[t], Sin[k t]] / Pi, {k, 1, max}]
```

```
{0, 0, 0, 0, 0, 0, 0, 0, 0, 0}
```

```
(*
```

```
Rzut funkcji f na przestrzeń rozpiętą przez sin(kt) i cos(kt) dla k ≤ n
```

```
*)
```

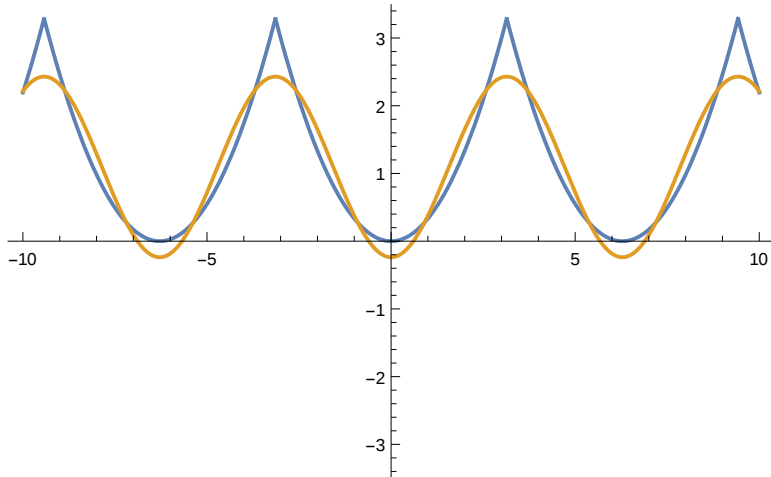
```
Do[szereg[t_] := a + Sum[b[[k]] Cos[k t] + c[[k]] Sin[k t], {k, 1, n}];
```

```
Print[szereg[t];
```

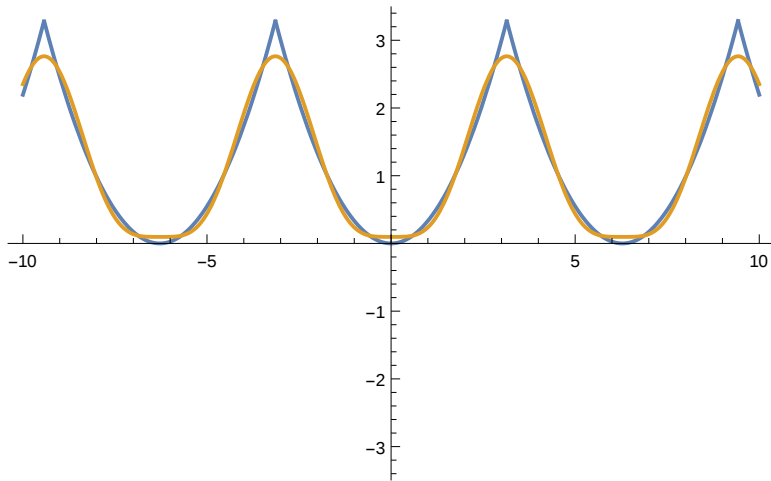
```
Print[Plot[{g[t], szereg[t]}, {t, -10, 10},
```

```
PlotStyle -> Thick, PlotRange -> 3.5, ImageSize -> 400]], {n, 1, max}]
```

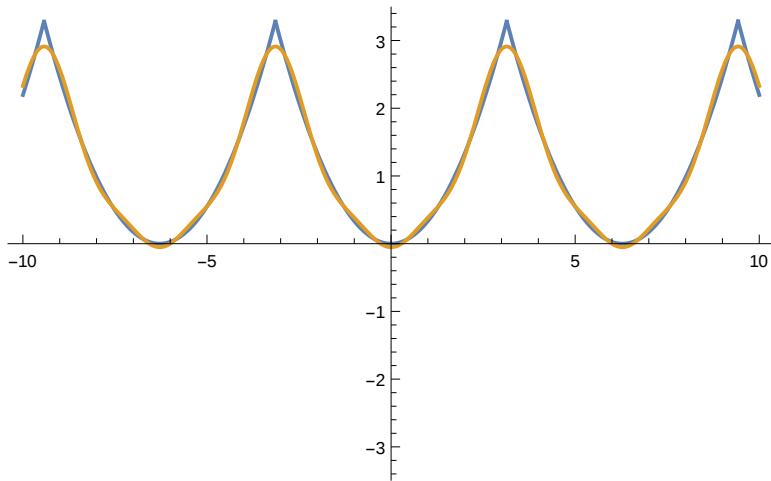
$$\frac{\pi^2}{9} - \frac{4 \cos[t]}{3}$$



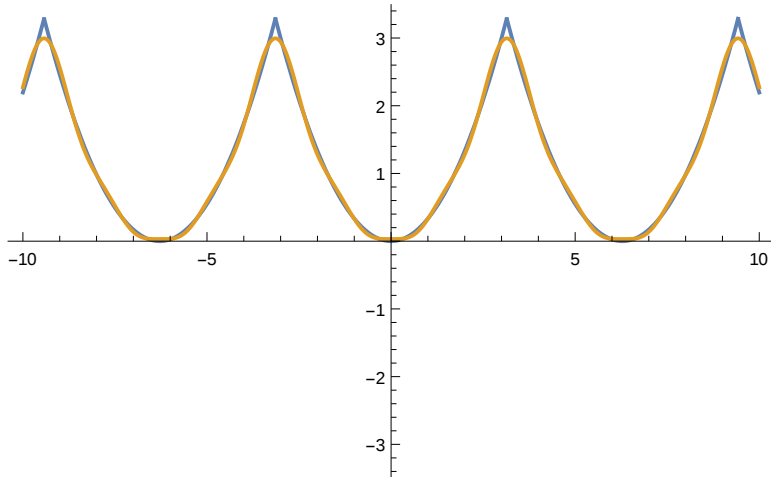
$$\frac{\pi^2}{9} - \frac{4 \cos[t]}{3} + \frac{1}{3} \cos[2t]$$



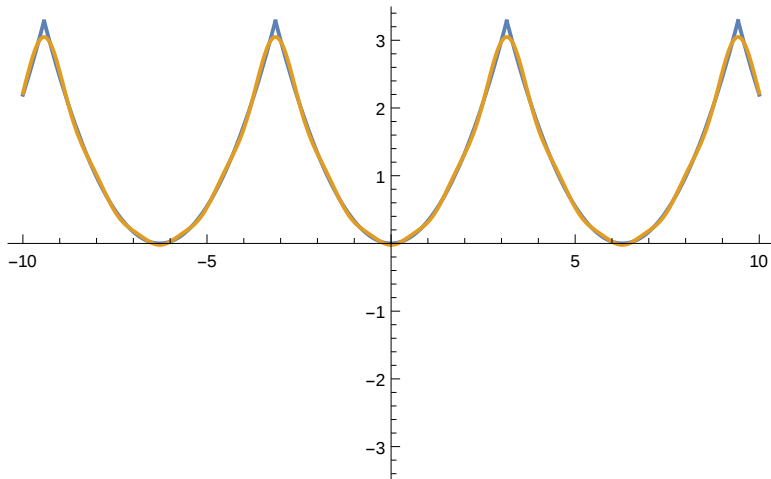
$$\frac{\pi^2}{9} - \frac{4 \cos[t]}{3} + \frac{1}{3} \cos[2t] - \frac{4}{27} \cos[3t]$$



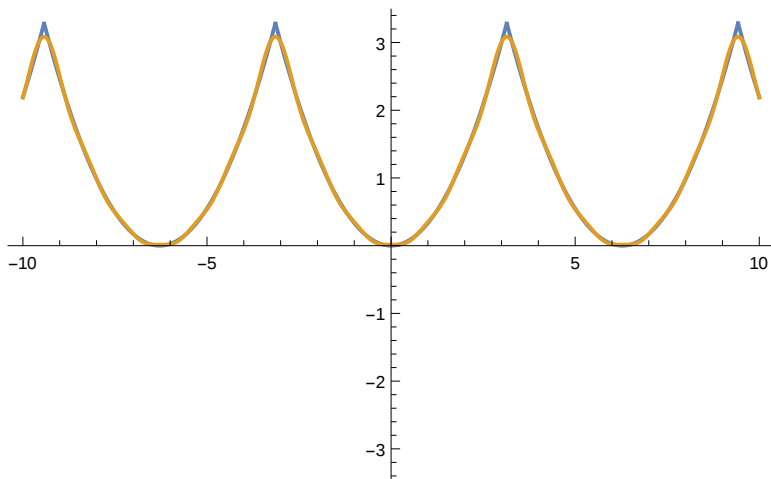
$$\frac{\pi^2}{9} - \frac{4 \cos[t]}{3} + \frac{1}{3} \cos[2t] - \frac{4}{27} \cos[3t] + \frac{1}{12} \cos[4t]$$



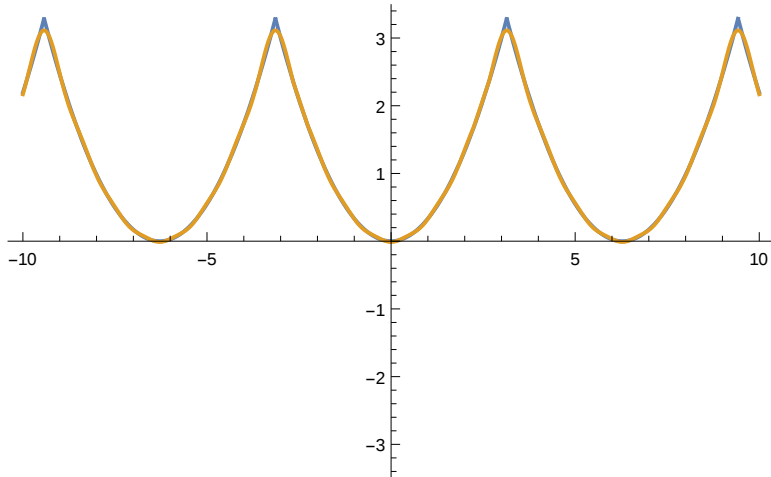
$$\frac{\pi^2}{9} - \frac{4 \operatorname{Cos}[t]}{3} + \frac{1}{3} \operatorname{Cos}[2 t] - \frac{4}{27} \operatorname{Cos}[3 t] + \frac{1}{12} \operatorname{Cos}[4 t] - \frac{4}{75} \operatorname{Cos}[5 t]$$



$$\frac{\pi^2}{9} - \frac{4 \operatorname{Cos}[t]}{3} + \frac{1}{3} \operatorname{Cos}[2 t] - \frac{4}{27} \operatorname{Cos}[3 t] + \frac{1}{12} \operatorname{Cos}[4 t] - \frac{4}{75} \operatorname{Cos}[5 t] + \frac{1}{27} \operatorname{Cos}[6 t]$$

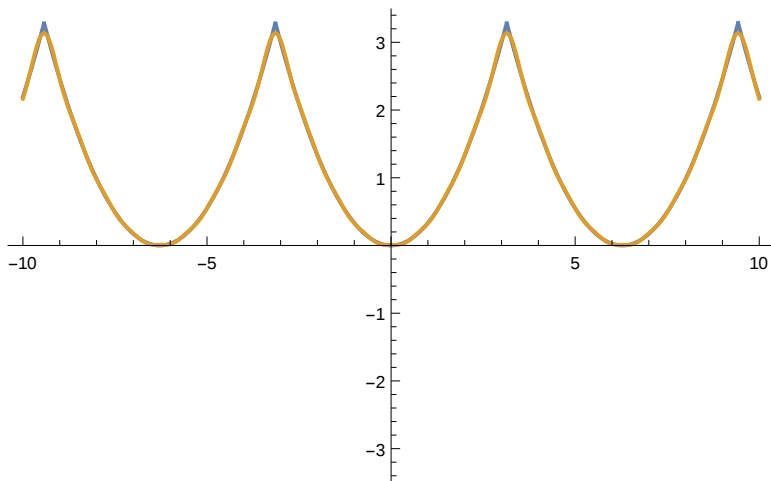


$$\frac{\pi^2}{9} - \frac{4 \operatorname{Cos}[t]}{3} + \frac{1}{3} \operatorname{Cos}[2 t] - \frac{4}{27} \operatorname{Cos}[3 t] + \frac{1}{12} \operatorname{Cos}[4 t] - \frac{4}{75} \operatorname{Cos}[5 t] + \frac{1}{27} \operatorname{Cos}[6 t] - \frac{4}{147} \operatorname{Cos}[7 t]$$



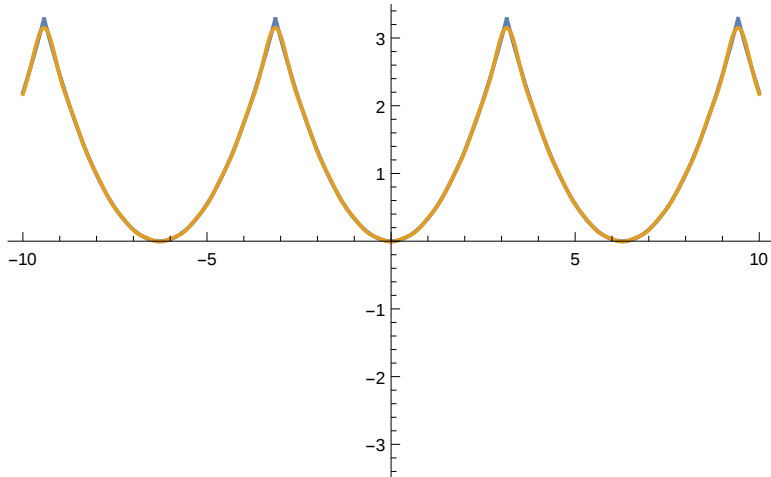
$$\frac{\pi^2}{9} - \frac{4 \cos[t]}{3} + \frac{1}{3} \cos[2t] - \frac{4}{27} \cos[3t] +$$

$$\frac{1}{12} \cos[4t] - \frac{4}{75} \cos[5t] + \frac{1}{27} \cos[6t] - \frac{4}{147} \cos[7t] + \frac{1}{48} \cos[8t]$$



$$\frac{\pi^2}{9} - \frac{4 \cos[t]}{3} + \frac{1}{3} \cos[2t] - \frac{4}{27} \cos[3t] + \frac{1}{12} \cos[4t] -$$

$$\frac{4}{75} \cos[5t] + \frac{1}{27} \cos[6t] - \frac{4}{147} \cos[7t] + \frac{1}{48} \cos[8t] - \frac{4}{243} \cos[9t]$$



$$\frac{\pi^2}{9} - \frac{4 \cos[t]}{3} + \frac{1}{3} \cos[2t] - \frac{4}{27} \cos[3t] + \frac{1}{12} \cos[4t] - \frac{4}{75} \cos[5t] +$$

$$\frac{1}{27} \cos[6t] - \frac{4}{147} \cos[7t] + \frac{1}{48} \cos[8t] - \frac{4}{243} \cos[9t] + \frac{1}{75} \cos[10t]$$

