```
> restart : with(LinearAlgebra) : with(plots) : with(plottools) : assume(k,
      'integer') :
> inproduct := (f, g)→int(conjugate(f)·g, t = −Pi..Pi) :
> NORM := f→sqrt(inproduct(f, f)) :
> v1 := 1 :
> v2 := cos(k·t) :
> v3 := sin(k·t) :
> c0 := 1/NORM(1)
```

$$c0 := \frac{\sqrt{2}}{2\sqrt{\pi}} \tag{1}$$

```
> sk := sin(k·t)/NORM(sin(k·t))
```

$$sk := \frac{\sin(k\sim t)}{\sqrt{\pi}} \tag{2}$$

```
> ck := cos(k·t)/NORM(cos(k·t))
```

$$ck := \frac{\cos(k\sim t)}{\sqrt{\pi}} \tag{3}$$

```
> #ii
> part_1 := inproduct(c0, t^2)
```

$$part\_1 := \frac{\sqrt{2}\,\pi^{5/2}}{3} \tag{4}$$

```
> part_2 := inproduct(ck, t^2)
```

$$part\_2 := \frac{4\sqrt{\pi}\,(-1)^{k\sim}}{k\sim^2} \tag{5}$$

```
> part_3 := inproduct(sk, t^2)
```

$$part\_3 := 0 \tag{6}$$

```
> f0 := part_1 + part_2 + part_3 :
> #iii
> p1 := inproduct(t^2, t^2)^2 :
> p2 := 2· inproduct(t^2, f0)
```

$$p2 := \frac{4\pi^{7/2}\left(\sqrt{2}\,\pi^2 k\sim^2 + 12\,(-1)^{k\sim}\right)}{9\,k\sim^2} \tag{7}$$

```
> p3 := simplify(inproduct(f0, f0)^2)
```

$$p3 := \frac{4\pi^4\left(\sqrt{2}\,\pi^2 k\sim^2 + 12\,(-1)^{k\sim}\right)^4}{81\,k\sim^8} \tag{8}$$

```
> res := evala(simplify(p1 - p2 + p3))
```

$$res := -\frac{1}{2025\,k\sim^{8}}\left(4\,\pi^{3}\left(-100\,\pi^{9}\,k\sim^{8}-2400\,\pi^{7}\,(-1)^{k\sim}\sqrt{2}\,k\sim^{6}-81\,\pi^{7}\,k\sim^{8}\right.\right.$$
$$+225\,\pi^{5/2}\sqrt{2}\,k\sim^{8}-43200\,\pi^{5}\,k\sim^{4}+2700\,(-1)^{k\sim}\,k\sim^{6}\sqrt{\pi}$$
$$\left.\left.-172800\,\pi^{3}\,(-1)^{k\sim}\sqrt{2}\,k\sim^{2}-518400\,\pi\right)\right) \qquad (9)$$

```
>
```