

In[]:= **t = 1 + Cos[ξ]**

Out[]:= 1 + Cos[ξ]

In[]:= **f = Simplify[**

Exp[I k / 2 / z (x - ξ) ^ 2] Exp[-I k / 2 / z (x - ξξ) ^ 2] Exp[-(ξ - ξξ) ^ 2 / 2 / σ ^ 2] (1 + Cos[2 π ξ]) (1 + Cos[2 π ξξ])]

Out[]:= $4 e^{-\frac{(\xi-\xi\xi)(z(\xi-\xi\xi)+k(2x-\xi-\xi\xi)\sigma^2)}{2z\sigma^2}} \text{Cos}[\pi\xi]^2 \text{Cos}[\pi\xi\xi]^2$

In[]:= **tem = Integrate[f, {ξ, -Infinity, Infinity}, Assumptions -> {Im[z] == 0, σ > 0, k > 0, z > 0}]**

Out[]:= $\frac{1}{\sqrt{-\frac{ik}{z} + \frac{1}{\sigma^2}}} e^{-\frac{4\pi^2 z^2 \sigma^2 + k^2(x-\xi\xi)^2 \sigma^2 + 4\pi z(-iz\xi\xi+kx\sigma^2)}{2z(z-ik\sigma^2)}} \left(e^{\frac{4k\pi x\sigma^2}{z-ik\sigma^2}} + e^{\frac{4\pi z\xi\xi}{iz+k\sigma^2}} + 2e^{\frac{2\pi(-iz\xi\xi+kx\sigma^2+\pi z\sigma^2)}{z-ik\sigma^2}} \right) \sqrt{2\pi} \text{Cos}[\pi\xi\xi]^2$

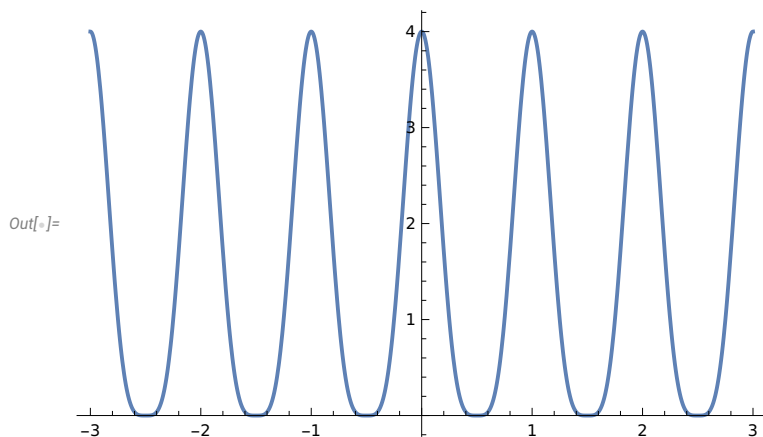
In[]:= **res = Integrate[tem, {ξξ, -Infinity, Infinity}, Assumptions -> {Im[z] == 0, σ > 0, k > 0, z > 0}]**

Out[]:= $\frac{1}{2k} e^{-2\pi\left(2ix + \frac{\pi z(-3iz^2+kz\sigma^2+k^2\sigma^4)}{k^2\sigma^2(iz+k\sigma^2)}\right)}$
 $\left(e^{\frac{2\pi^2 z(-7z^2+3ikz\sigma^2+k^2\sigma^4)}{k^2\sigma^2(z-ik\sigma^2)}} + 2e^{\frac{2\pi(k^2x\sigma^2(-z+ik\sigma^2)+\pi z^2(-4iz+k\sigma^2))}{k^2\sigma^2(iz+k\sigma^2)}} + 2e^{2\pi\left(3ix + \frac{\pi z^2(-4iz+k\sigma^2)}{k^2\sigma^2(iz+k\sigma^2)}\right)} + 6e^{2\pi\left(2ix + \frac{\pi z(-3iz^2+kz\sigma^2+k^2\sigma^4)}{k^2\sigma^2(iz+k\sigma^2)}\right)} \right) +$
 $e^{2i\pi\left(4x + \frac{\pi z(-7z^2+3ikz\sigma^2+k^2\sigma^4)}{k^2\sigma^2(iz+k\sigma^2)}\right)} + 2e^{2i\pi\left(x + \frac{\pi z(-4z^2+ikz\sigma^2+2k^2\sigma^4)}{k^2\sigma^2(iz+k\sigma^2)}\right)} + 2e^{2i\pi\left(3x + \frac{\pi z(-4z^2+ikz\sigma^2+2k^2\sigma^4)}{k^2\sigma^2(iz+k\sigma^2)}\right)} \Big) \pi z$

In[]:= **res2 = res /. {k -> 1, σ -> 1000};**

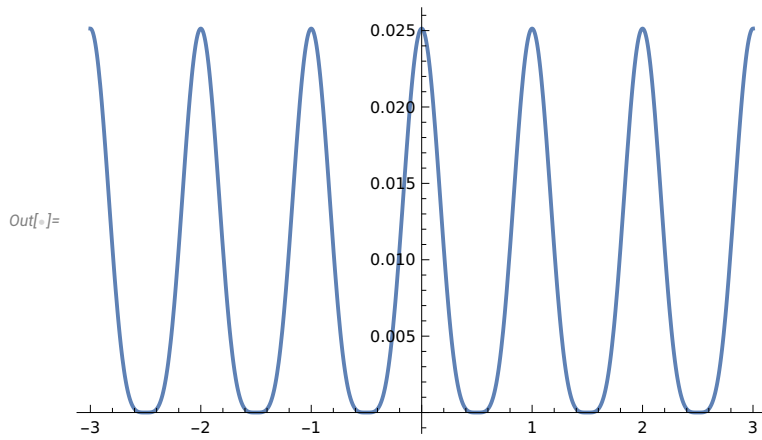
(* predmet *)

In[]:= **Plot[(1 + Cos[2 π ξ]) ^ 2, {ξ, -3, 3}]**



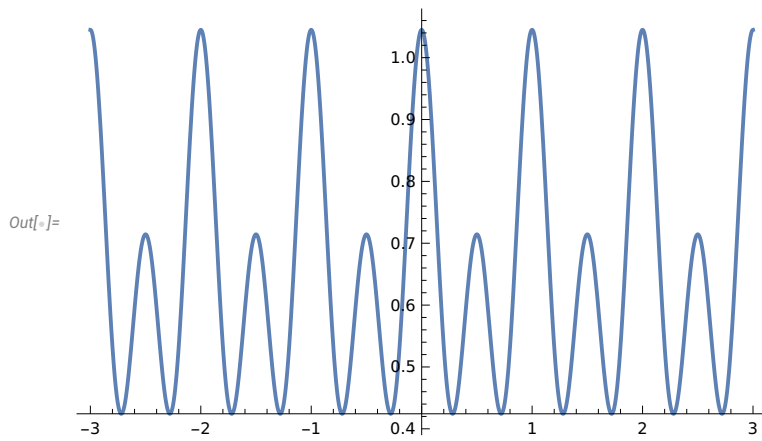
(* kontrola *)

In[]:= Plot[Abs[res2 /. z -> 0.001], {x, -3, 3}]



(* obecna vzdalenost *)

In[]:= Plot[Abs[res2 /. z -> 0.07], {x, -3, 3}]



(* Talbotuv obraz *)

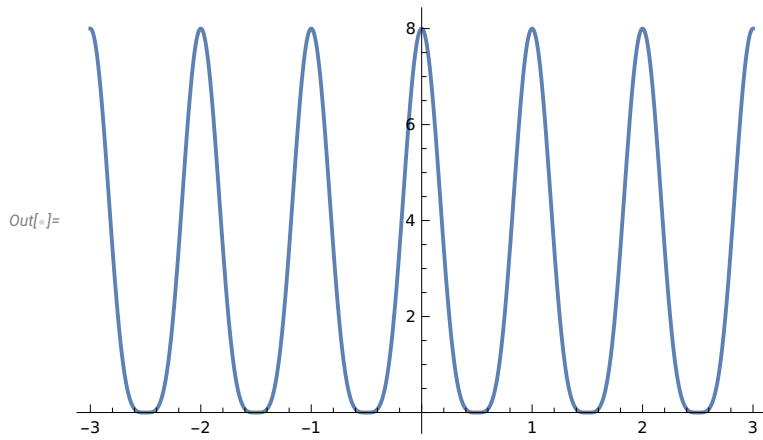
In[]:= ztal = k n L^2 / π

Out[]:=
$$\frac{k L^2 n}{\pi}$$

In[]:= z1 = ztal /. {k -> 1, L -> 1, n -> 1} // N

Out[]:= 0.31831

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In[ ]:= Plot[Abs[res2 /. z -> z1], {x, -3, 3}]
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(* inverzni Talbotuv obraz *)

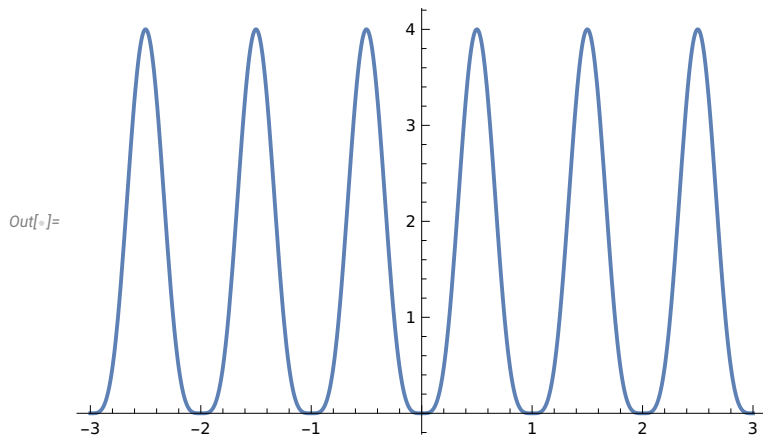
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In[ ]:= zinvtal = ztal / 2
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Out[]:=
$$\frac{k L^2 n}{2 \pi}$$

```
In[ ]:= z2 = zinvtal /. {k -> 1, L -> 1, n -> 1} // N
```

Out[]:= 0.159155

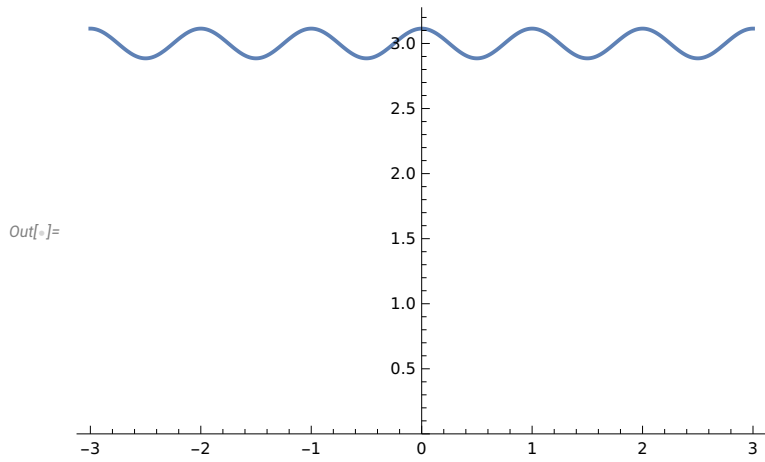
```
In[ ]:= Plot[Abs[res2 /. z -> z2], {x, -3, 3}]
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(* obrazy pro snizenou koherenci *)

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In[ ]:= res3 = res /. {k -> 1, sigma -> 0.75};
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In[]:= Plot[Abs[res3 /. z -> z1], {x, -3, 3}, PlotRange -> {0, All}]



In[]:= Plot[Abs[res3 /. z -> z2], {x, -3, 3}, PlotRange -> {0, All}]

