

```

In[1]:= $TextStyle = {FontFamily -> "Times", FontSize -> 14};
<< Graphics`Graphics` (* needed for BarChart *)

In[3]:= Clear[k0, σ];
F[k_, k0_, σ_] := Exp[-(k - k0)^2 / (2 * σ^2)] / (√(2 π) σ)
f = Integrate[F[k, k00, σ0] Sin[k x], {k, 0, ∞}, Assumptions -> σ0 > 0]

Out[5]= - $\frac{1}{4} i e^{-\frac{1}{2} \times (2 i k00 + x \sigma0^2)} \left( -1 - \text{Erf}\left[\frac{k00 - i x \sigma0^2}{\sqrt{2} \sigma0}\right] + e^{2 i k00 x} \left( 1 + \text{Erf}\left[\frac{k00 + i x \sigma0^2}{\sqrt{2} \sigma0}\right] \right) \right)$ 

In[6]:= g = Integrate[F[k, k00, σ0] Sin[k x], {k, -∞, ∞}, Assumptions -> σ0 > 0]

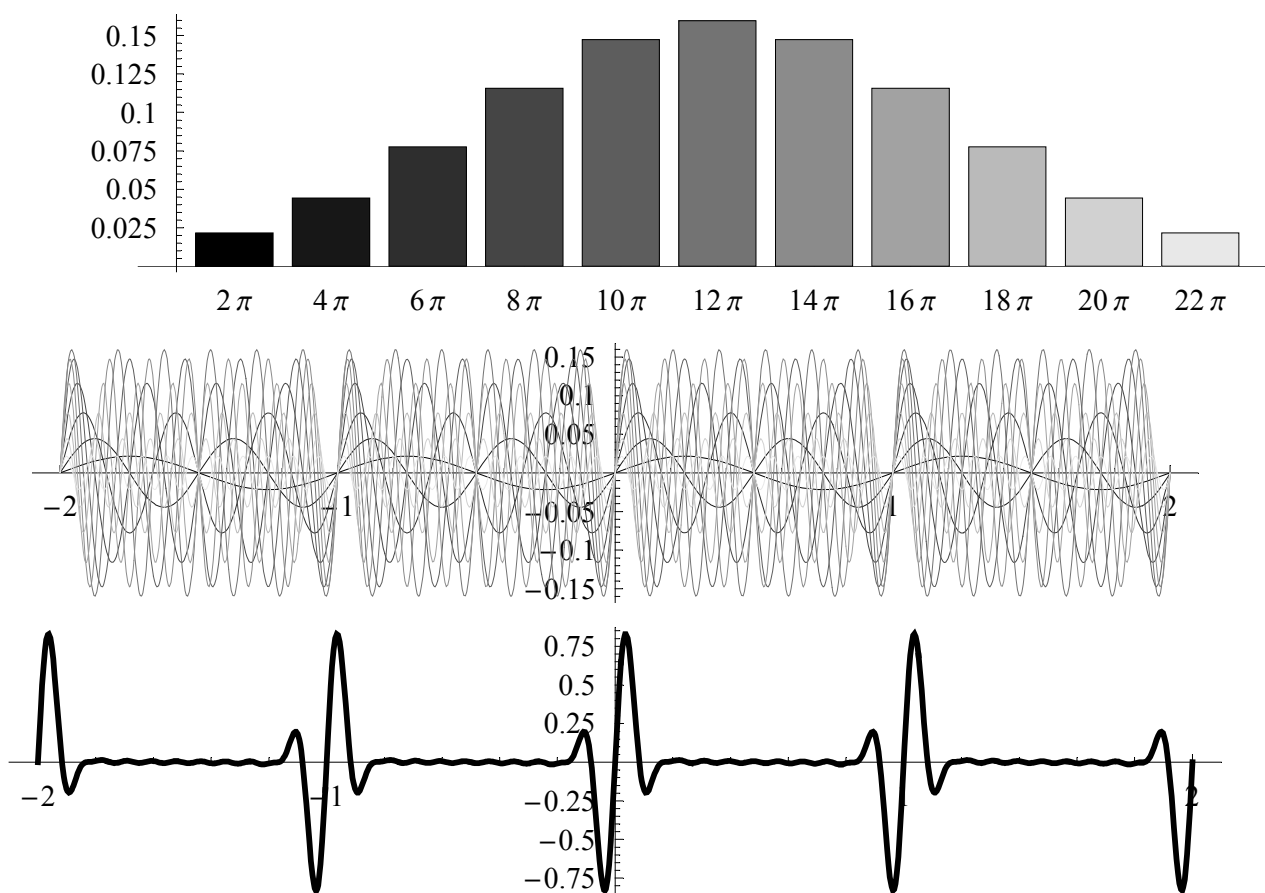
Out[6]=  $e^{-\frac{1}{2} x^2 \sigma0^2} \text{Sin}[k00 x]$ 

In[15]:= makeplot[σ_, k0_] := Module[{},
  For[n = 1, n ≤ 8, n = n + 2,
    elems = 12 * n - 1;
    coeffs = 2 π / n Table[F[2 π k / n, k0, σ], {k, elems}];
    sins = Table[Sin[2 π k x / n], {k, elems}];
    list = coeffs * sins;
    colors = Array[GrayLevel[(# - 1) / elems] &, elems];
    If[Mod[σ, π] == 0,
      Print[StringJoin["Δx = 1/", ToString[σ / π], "π, Δk = ", ToString[σ / π],
        "π, k1 = 2π/", ToString[n], ", k0=", ToString[k0 / π], "π"]],
      Print[StringJoin["Δx = 1/", ToString[σ], ", Δk = ", ToString[σ],
        ", k1 = 2π/", ToString[n], ", k0=", ToString[k0 / π], "π"]]];
    BarChart[coeffs, BarStyle -> colors, BarLabels ->
      Flatten[Array[Append[Table["", {n - 1}], 2 π #] &, (elems + 1) / n - 1]],
      AspectRatio -> 1 / 4.5, ImageSize -> 72 * 9, PlotRange -> {{0, 12 n}, All}];
    Plot[Evaluate[list], {x, -2, 2}, PlotRange -> All, AspectRatio -> 1 / 4.5,
      PlotStyle -> colors, ImageSize -> 72 * 8];
    Plot[Evaluate[Sum[list[[n]], {n, elems}]], {x, -2, 2}, PlotRange -> All,
      AspectRatio -> 1 / 4.5, PlotStyle -> Thickness[0.005], ImageSize -> 72 * 8];]
    If[Mod[σ, π] == 0,
      Print[StringJoin["Δx = 1/", ToString[σ / π], "π, Δk = ",
        ToString[σ / π], "π, k1 = 0", ", k0=", ToString[k0 / π], "π"]],
      Print[StringJoin["Δx = 1/", ToString[σ], ", Δk = ", ToString[σ],
        ", k1 = 0", ", k0=", ToString[k0 / π], "π"]]];
    Plot[F[k, k0, σ], {k, 0, 24 π}, PlotRange -> {{0, 24 π}, {0, F[k0, k0, σ]}}, AspectRatio ->
      1 / 4.5, ImageSize -> 72 * 8, Ticks -> {Table[i π, {i, 2, 22, 2}], Automatic}];
    Plot[f /. {k00 -> k0, σ0 -> σ}, {x, -2, 2}, PlotRange -> All, AspectRatio -> 1 / 4.5,
      PlotStyle -> Thickness[0.005], ImageSize -> 72 * 8];]

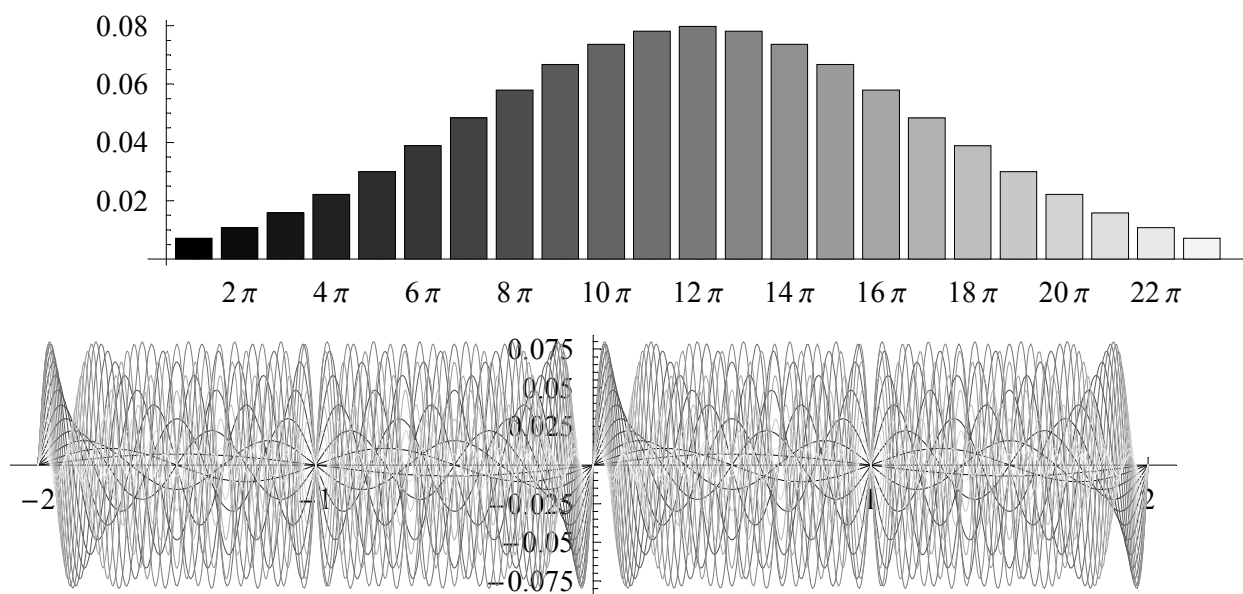
In[16]:= makeplot[5 π, 12 π];
makeplot[4 π, 12 π];
makeplot[3 π, 12 π];
makeplot[2 π, 12 π];
makeplot[1 π, 12 π];
makeplot[1, 12 π];

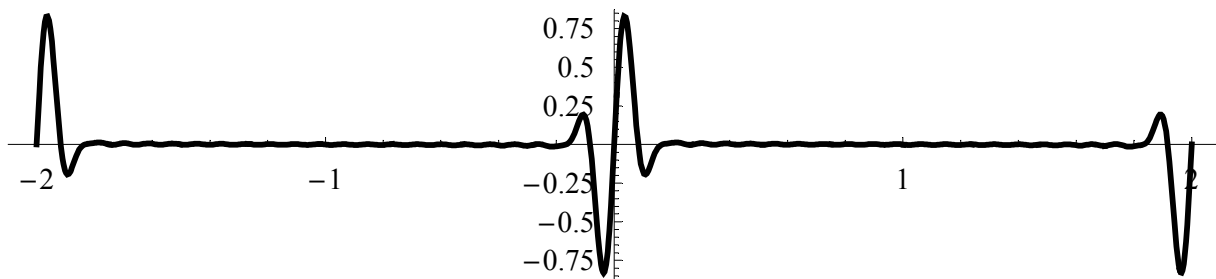
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Δx = 1/5π, Δk = 5π, k₁ = 2π/1, k₀=12π

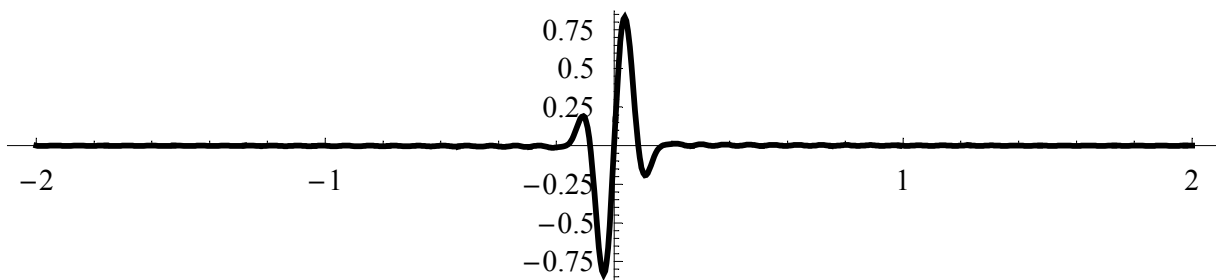
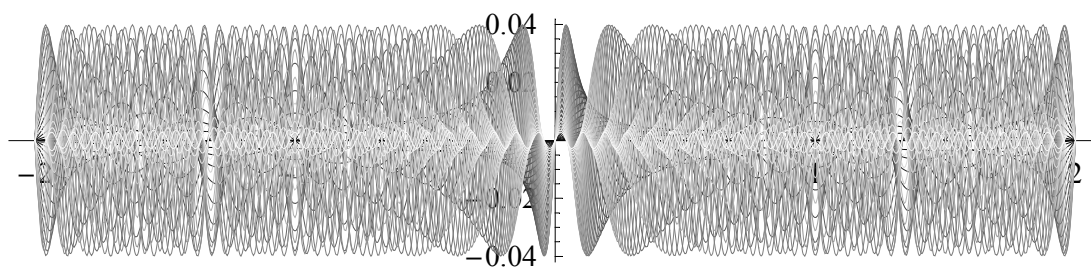
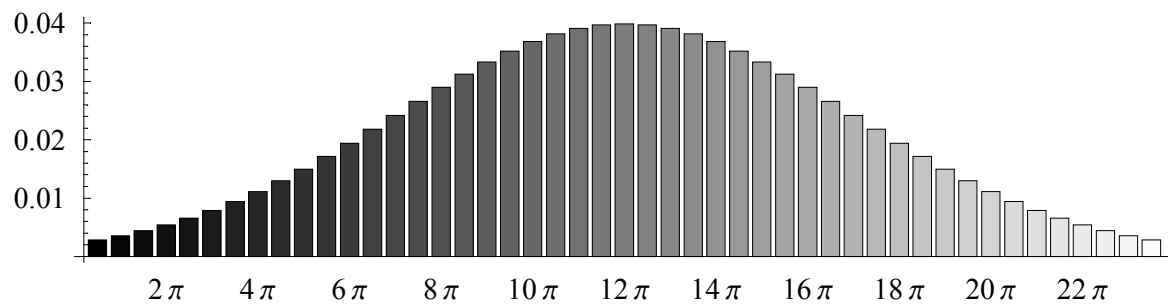


$$\Delta x = 1/5\pi, \Delta k = 5\pi, k_1 = 2\pi/2, k_0 = 12\pi$$

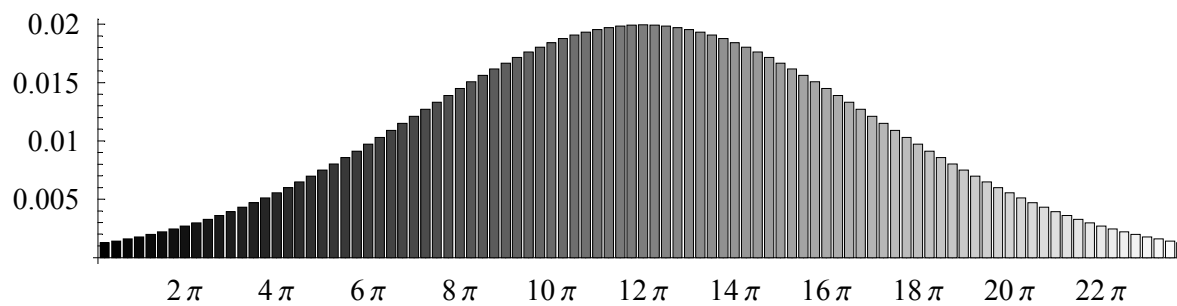


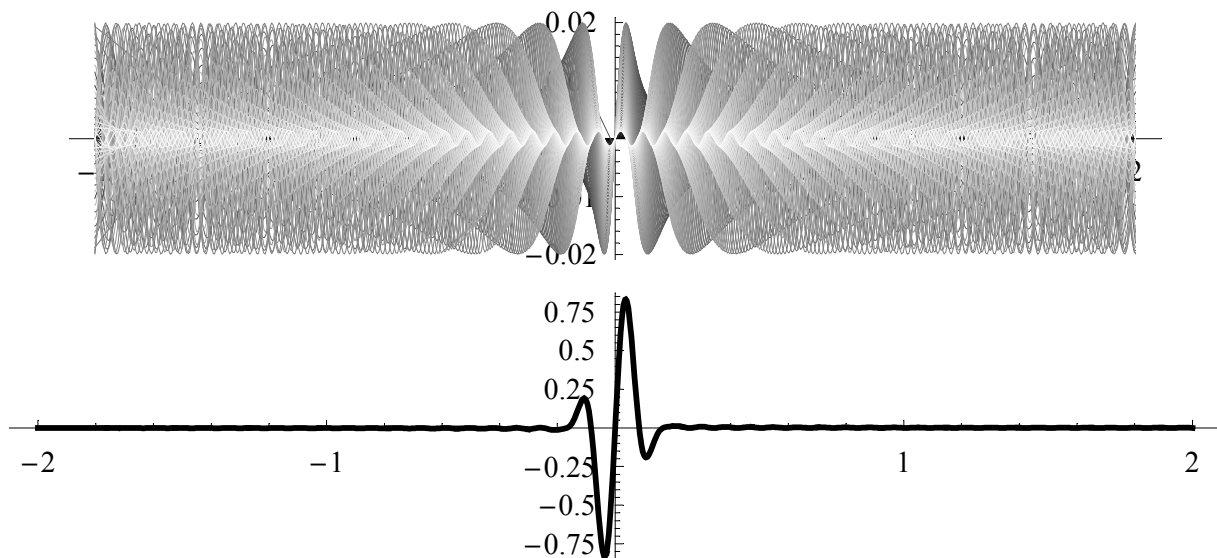


$$\Delta x = 1/5\pi, \Delta k = 5\pi, k_1 = 2\pi/4, k_0 = 12\pi$$

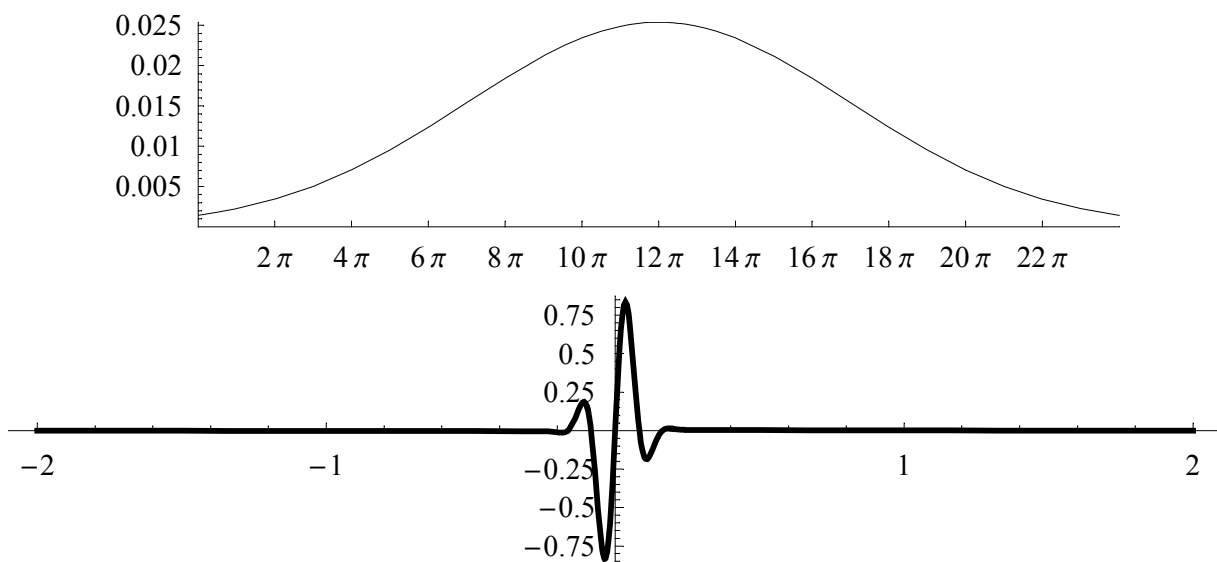


$$\Delta x = 1/5\pi, \Delta k = 5\pi, k_1 = 2\pi/8, k_0 = 12\pi$$

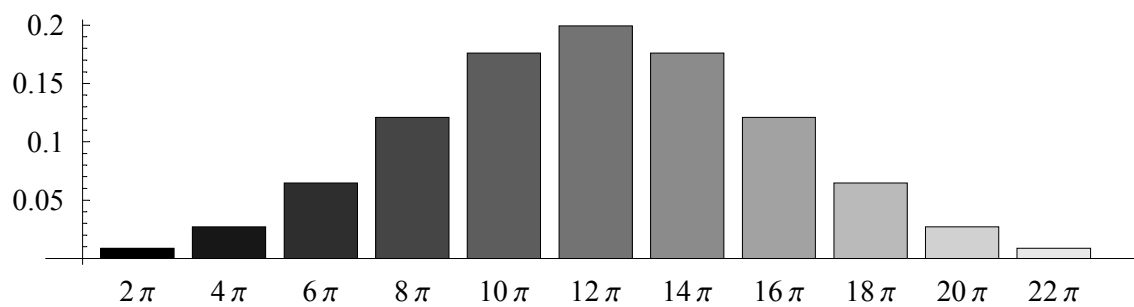


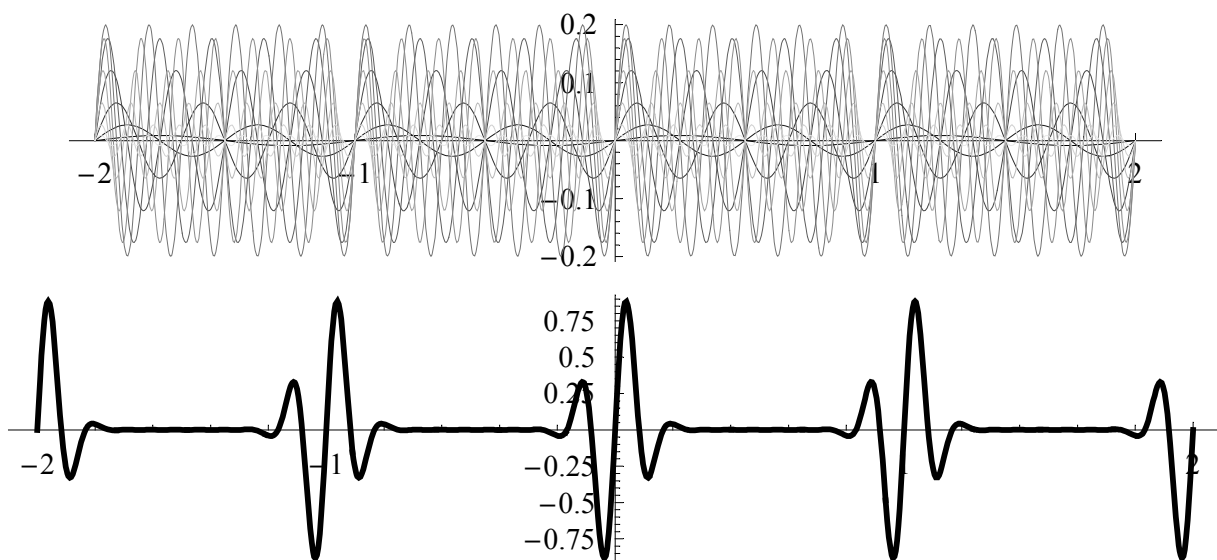


$$\Delta x = 1/5\pi, \Delta k = 5\pi, k_1 = 0, k_0 = 12\pi$$

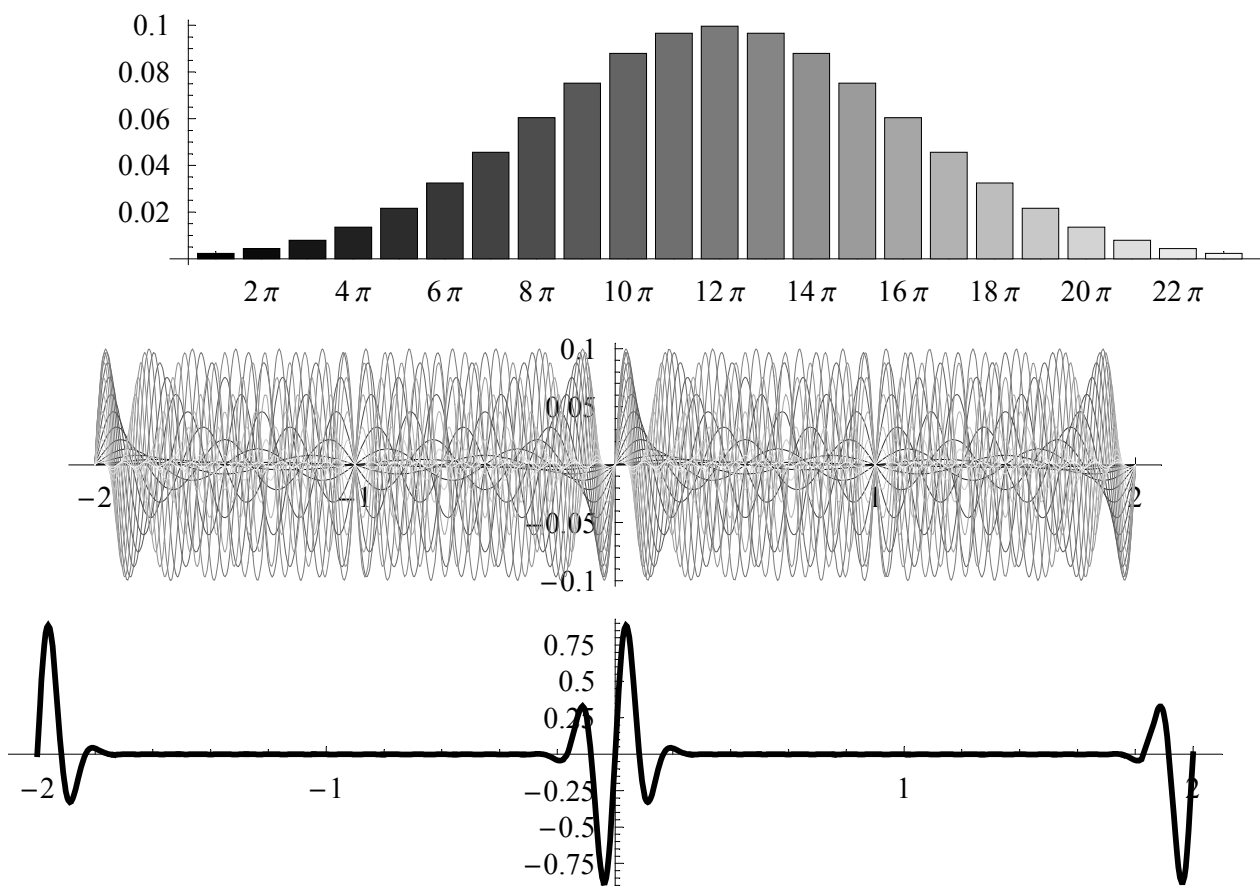


$$\Delta x = 1/4\pi, \Delta k = 4\pi, k_1 = 2\pi/1, k_0 = 12\pi$$

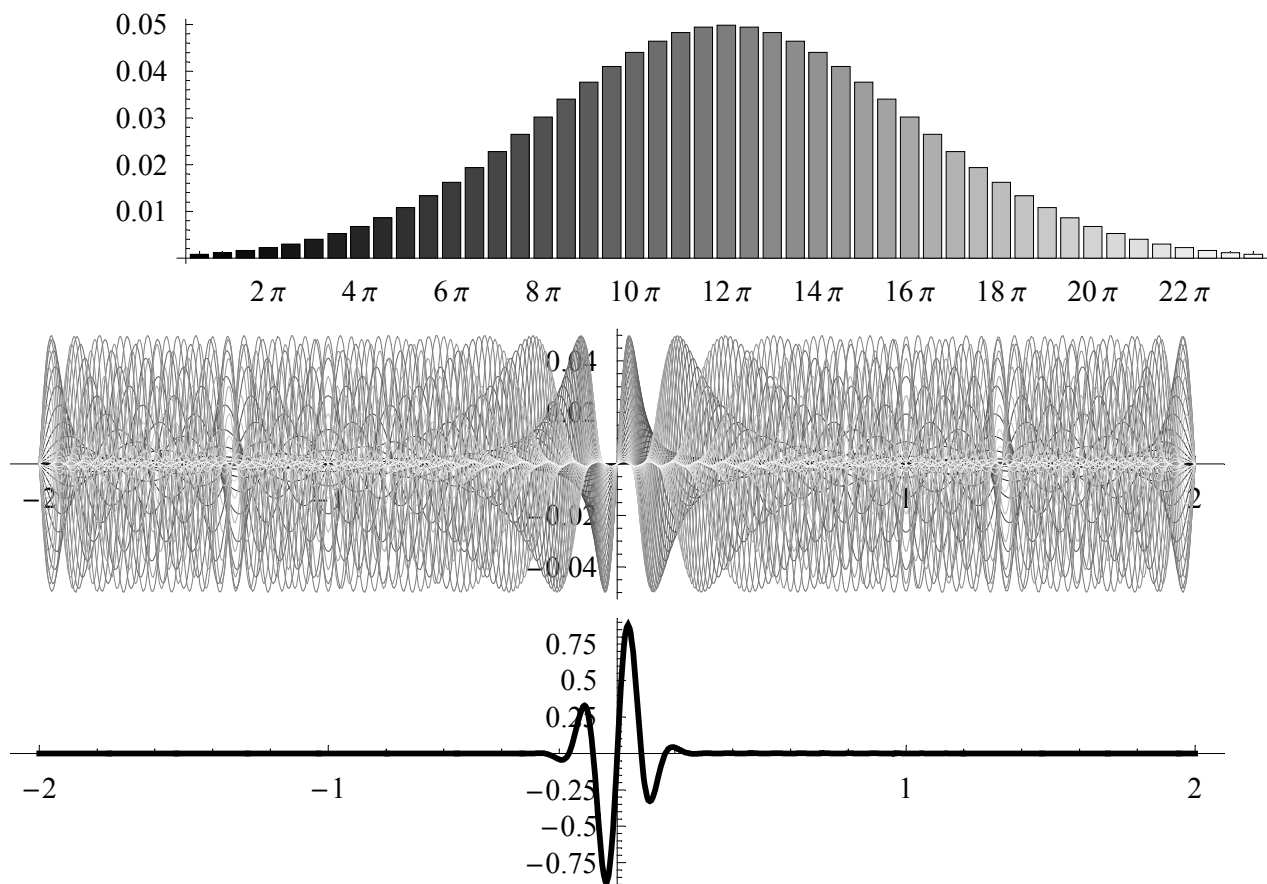




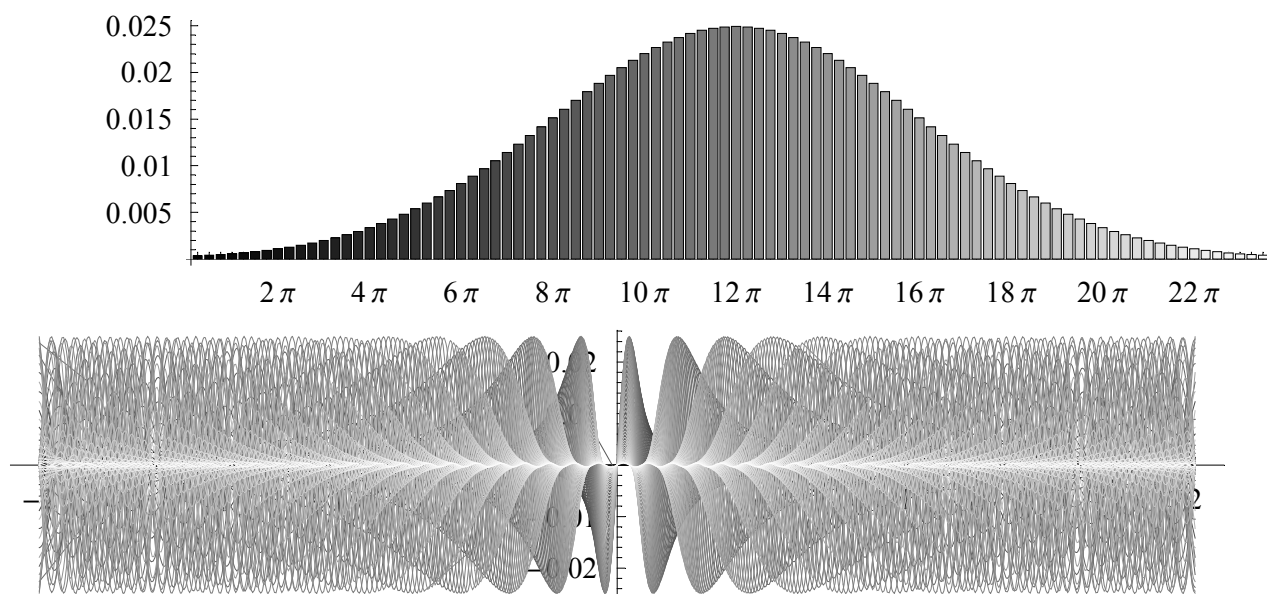
$$\Delta x = 1/4\pi, \Delta k = 4\pi, k_1 = 2\pi/2, k_0 = 12\pi$$

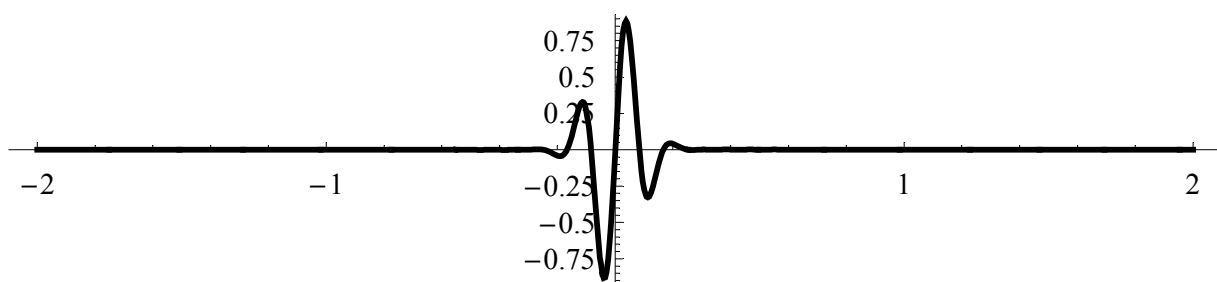


$$\Delta x = 1/4\pi, \Delta k = 4\pi, k_1 = 2\pi/4, k_0 = 12\pi$$

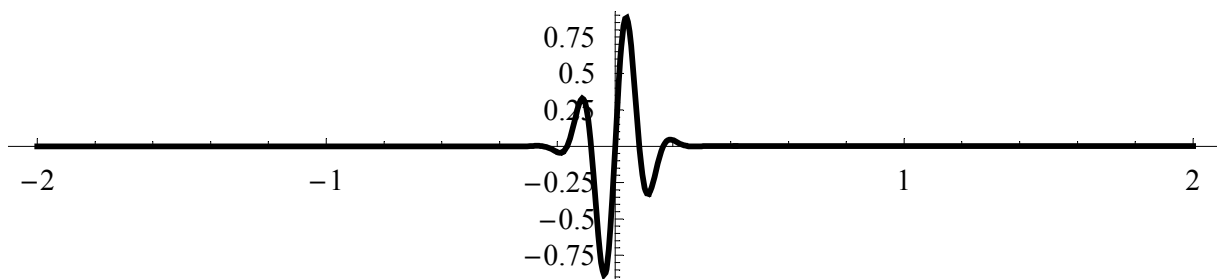
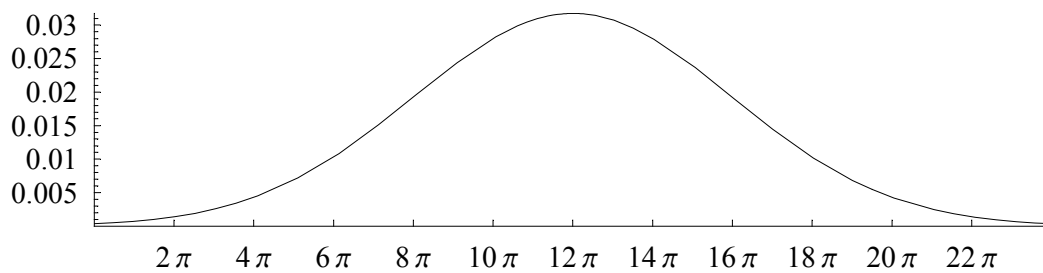


$$\Delta x = 1/4\pi, \Delta k = 4\pi, k_1 = 2\pi/8, k_0 = 12\pi$$

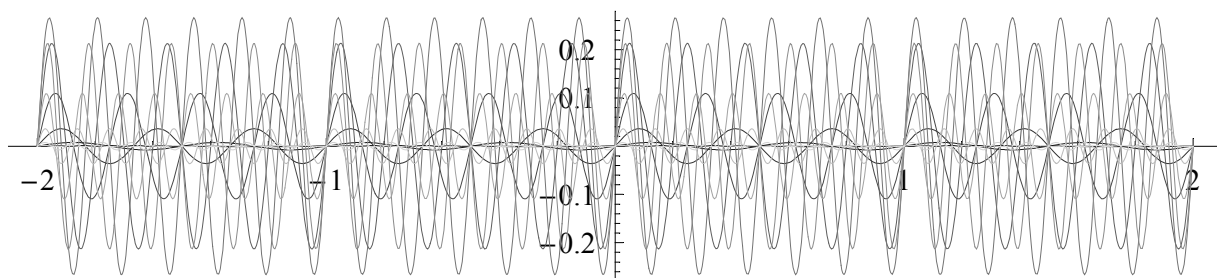
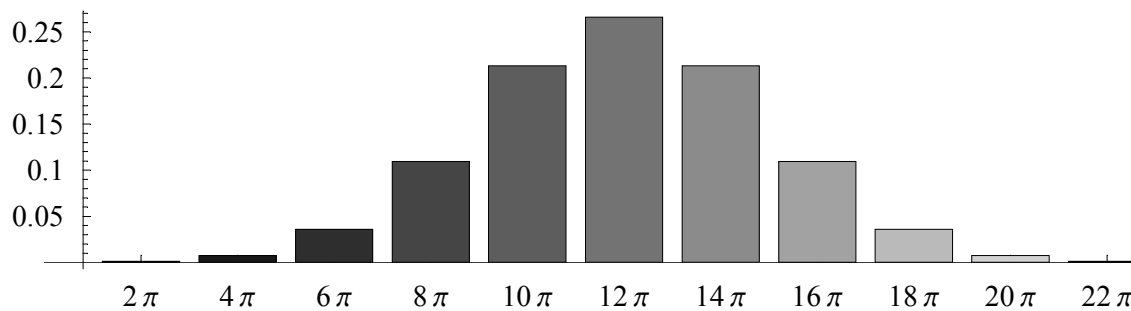


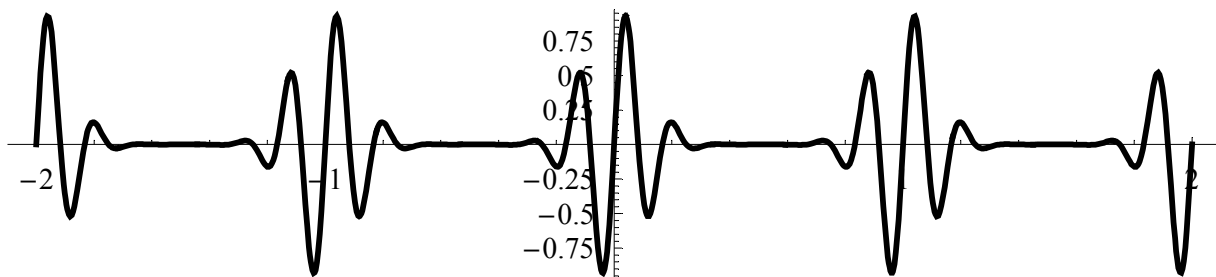


$$\Delta x = 1/4\pi, \Delta k = 4\pi, k_1 = 0, k_0 = 12\pi$$

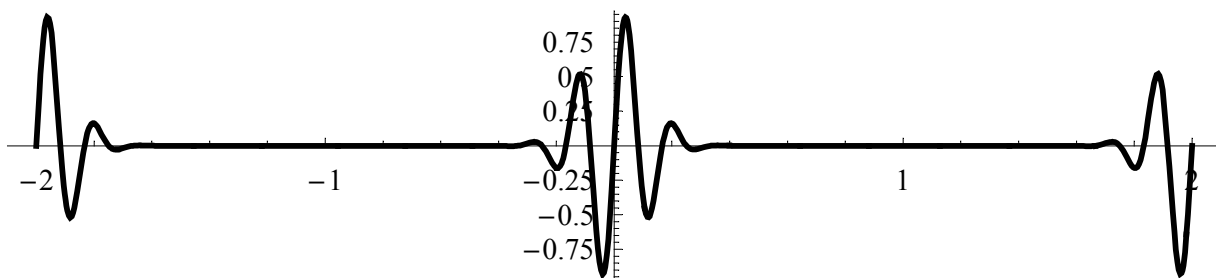
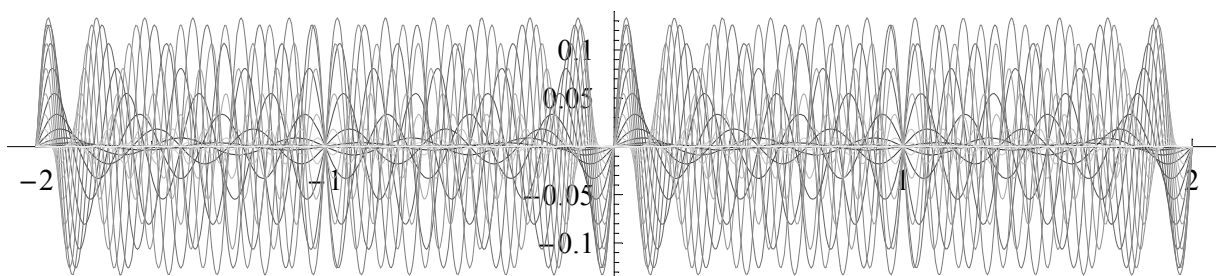
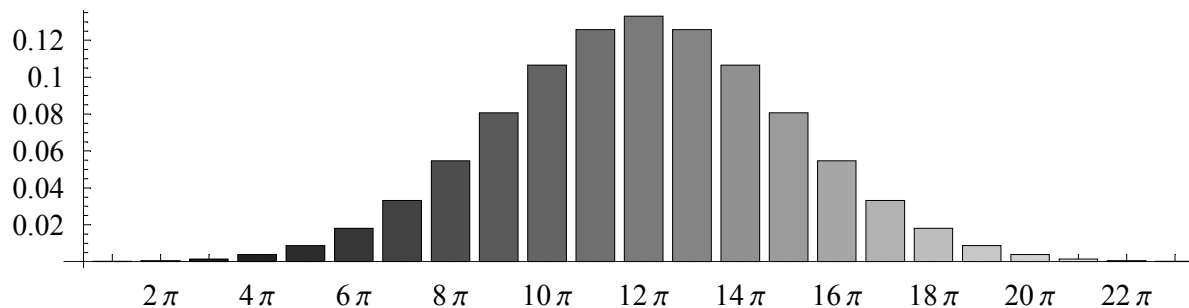


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/1, k_0 = 12\pi$$

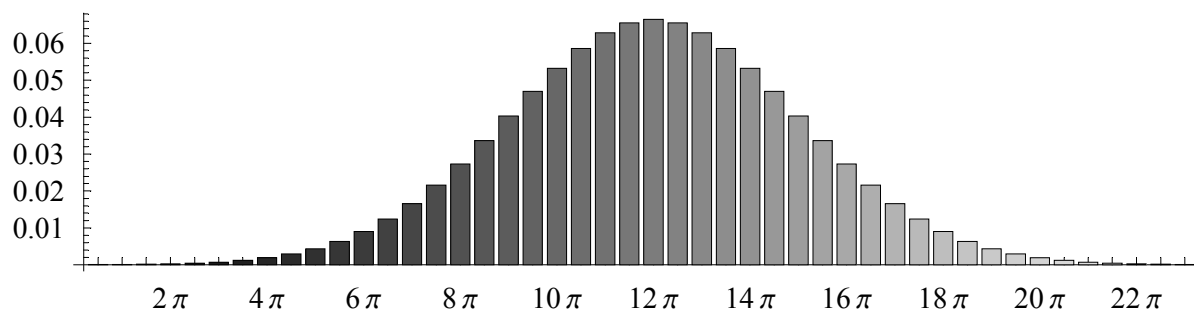


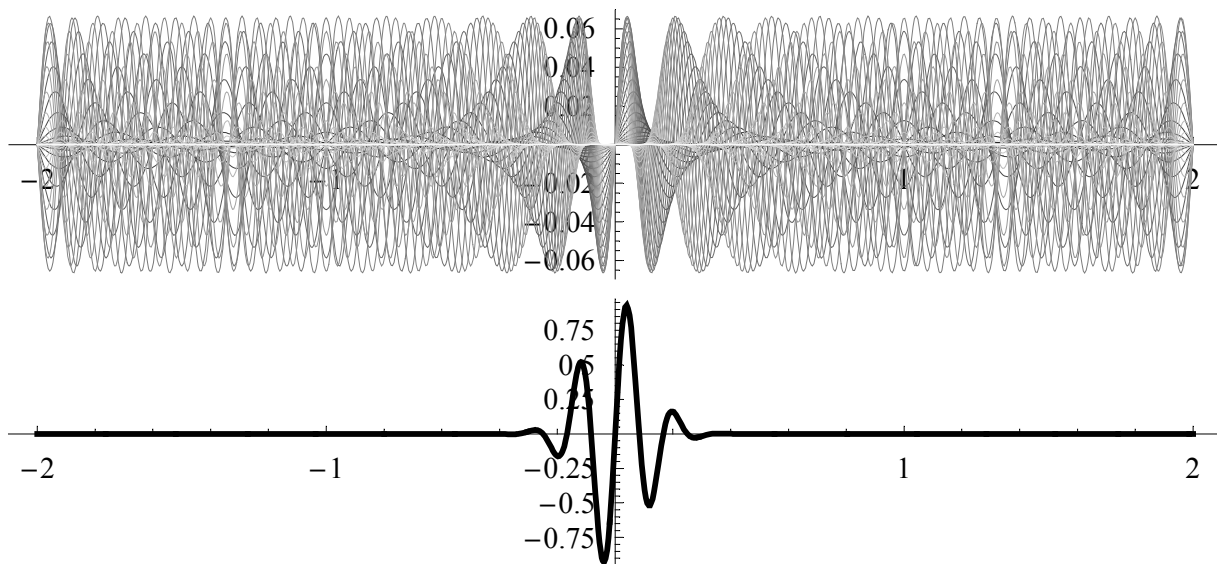


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/2, k_0 = 12\pi$$

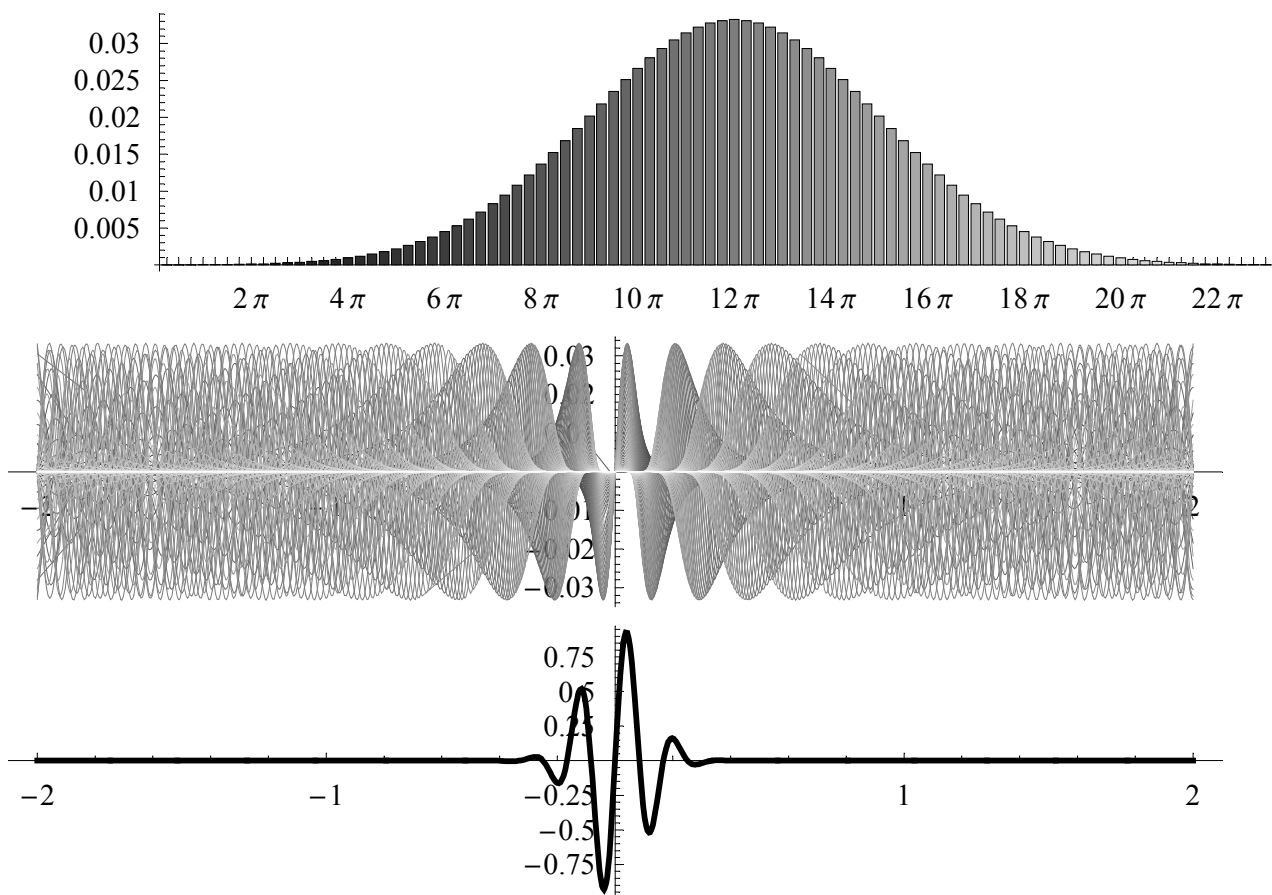


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/4, k_0 = 12\pi$$

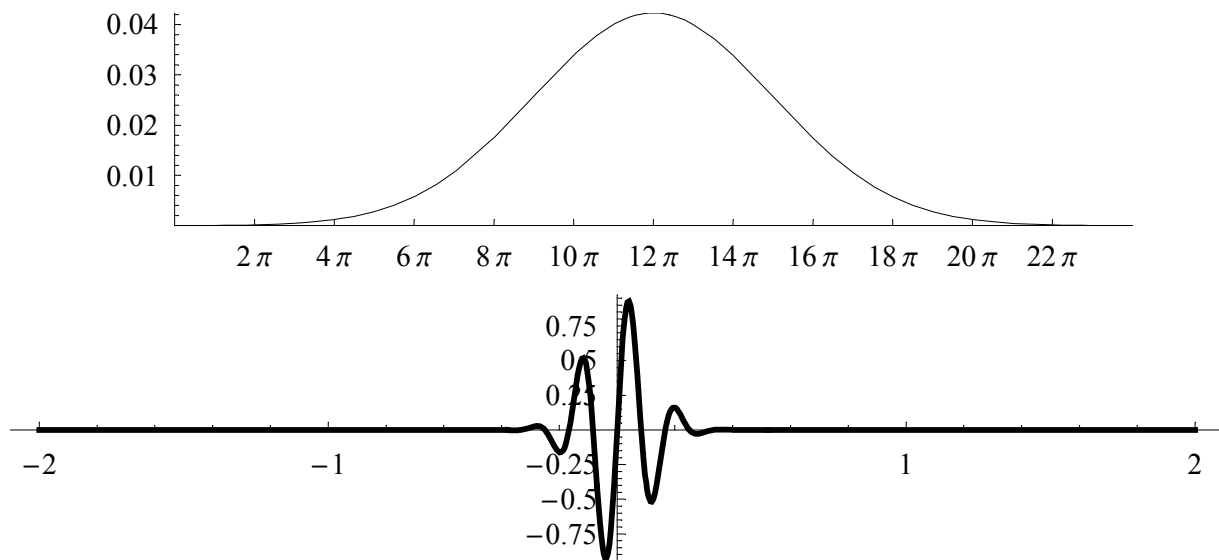




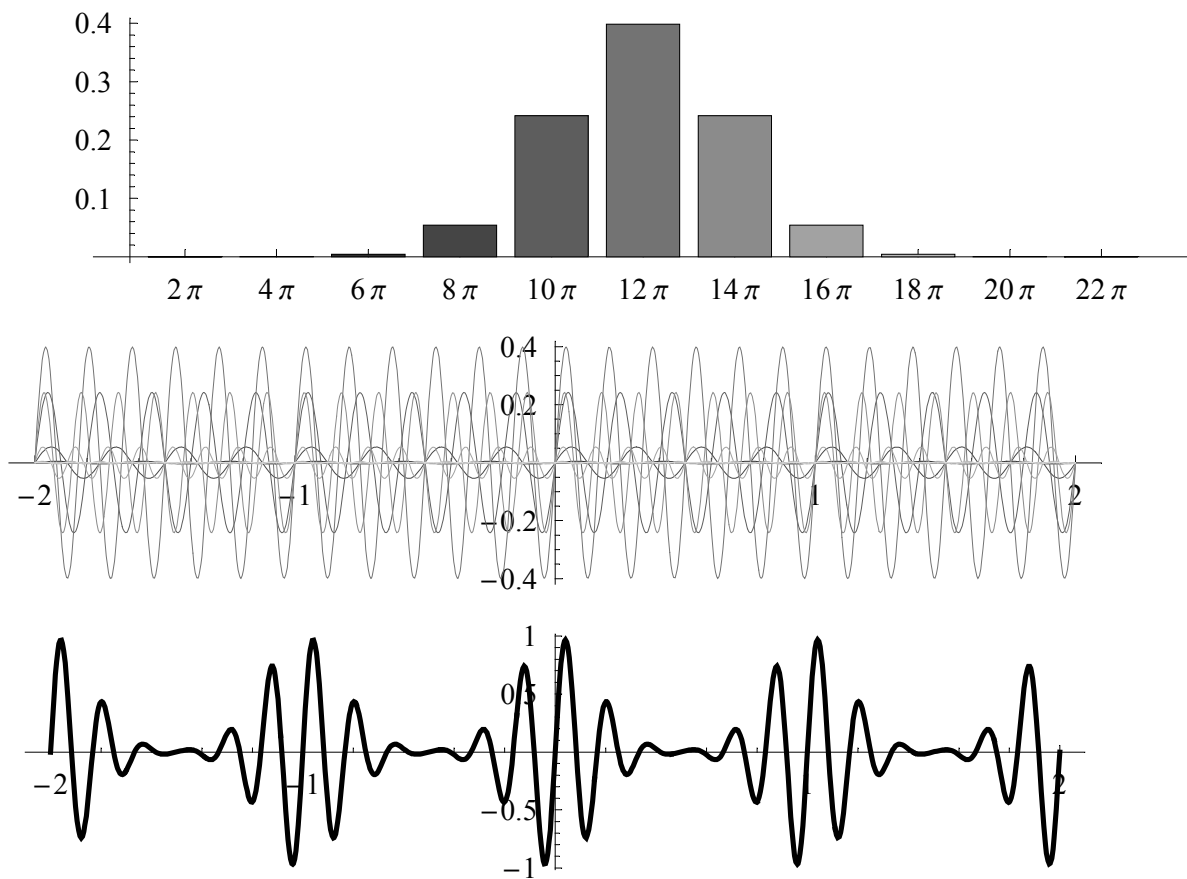
$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/8, k_0 = 12\pi$$



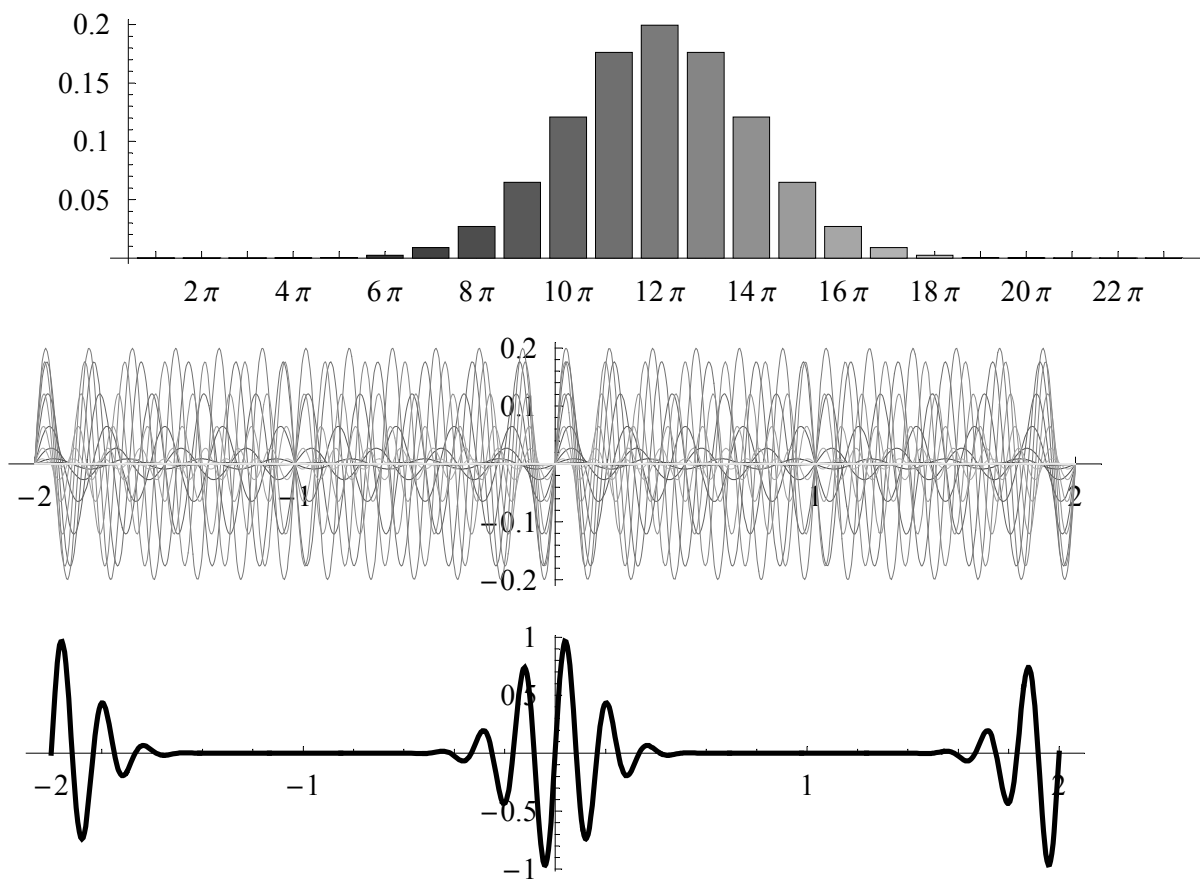
$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 0, k_0 = 12\pi$$



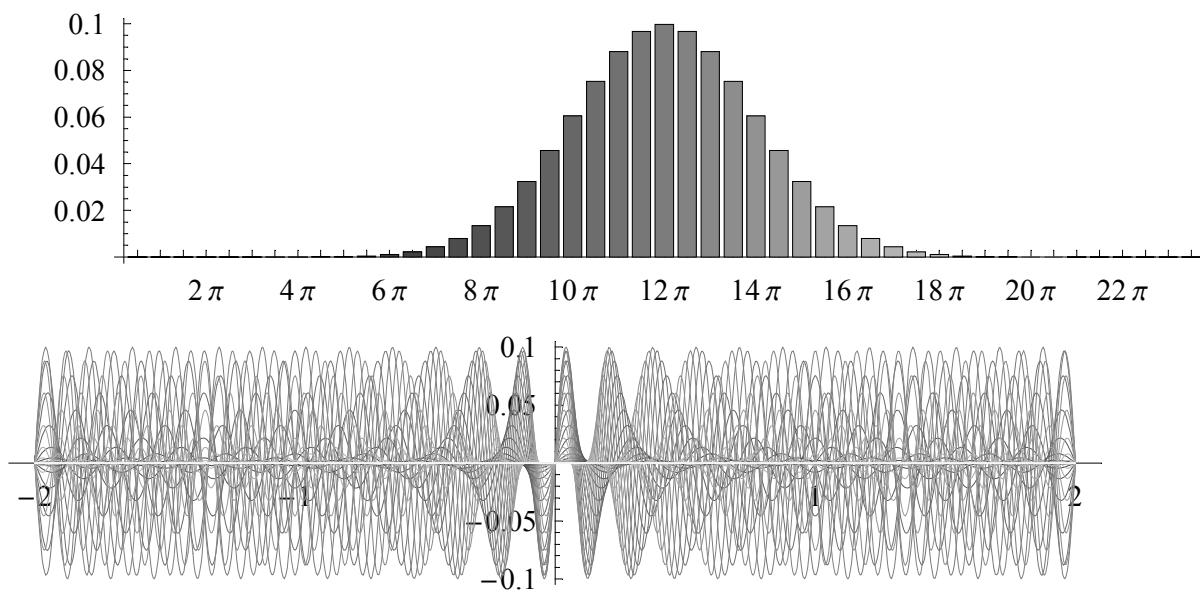
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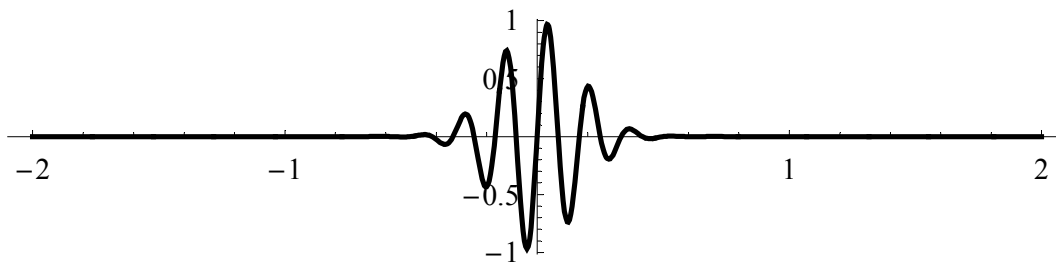


$$\Delta x = 1/2\pi, \Delta k = 2\pi, k_1 = 2\pi/2, k_0 = 12\pi$$

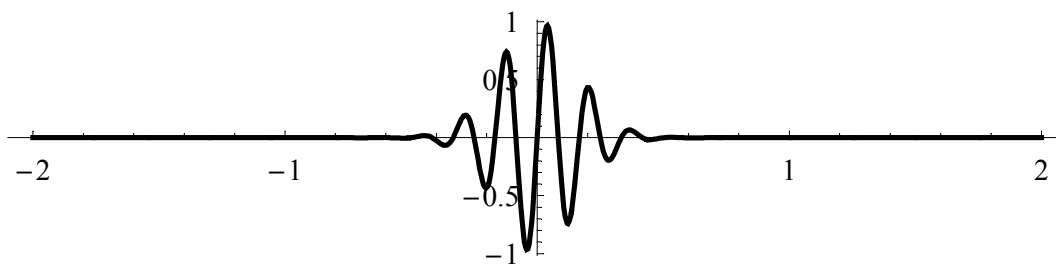
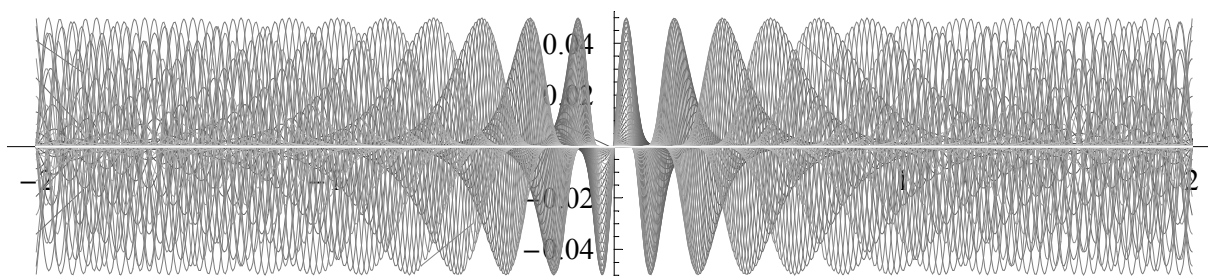
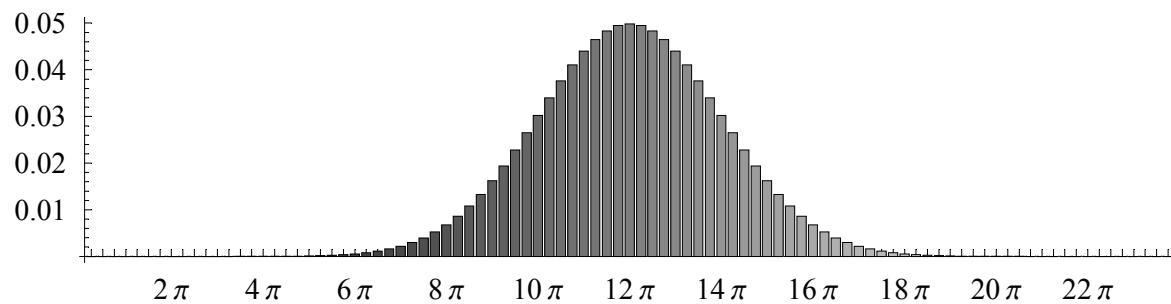


$$\Delta x = 1/2\pi, \Delta k = 2\pi, k_1 = 2\pi/4, k_0 = 12\pi$$

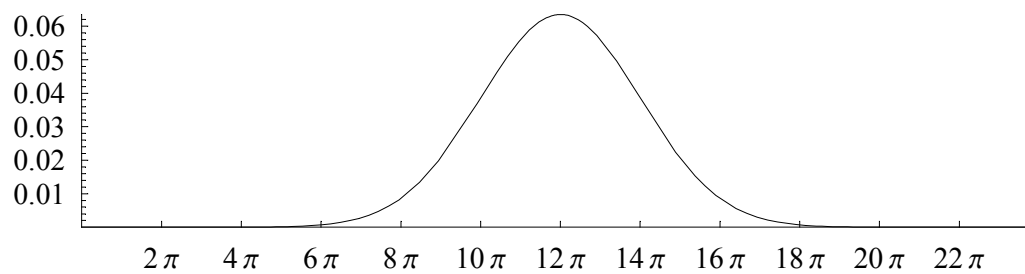


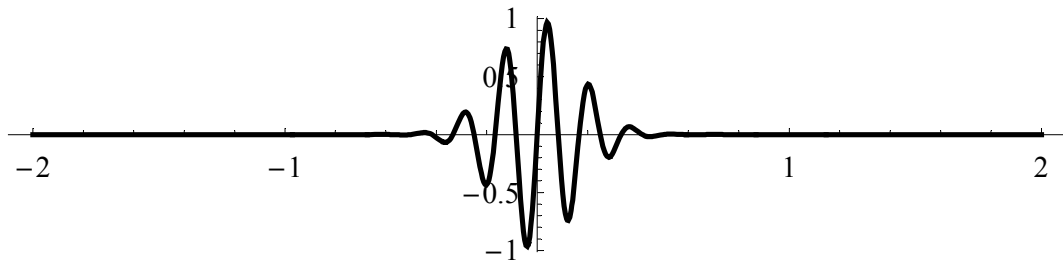


$$\Delta x = 1/2\pi, \Delta k = 2\pi, k_1 = 2\pi/8, k_0 = 12\pi$$

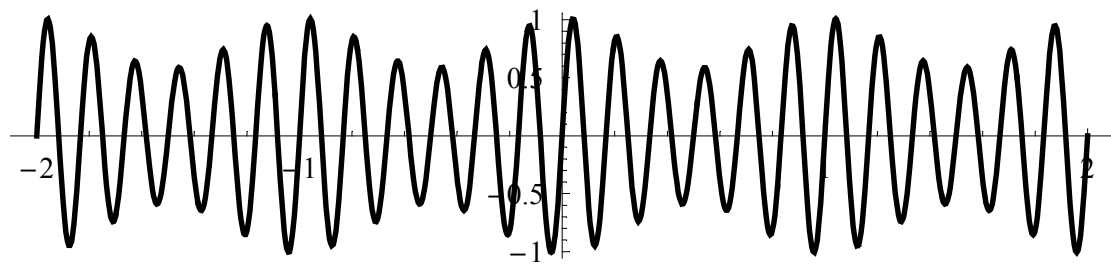
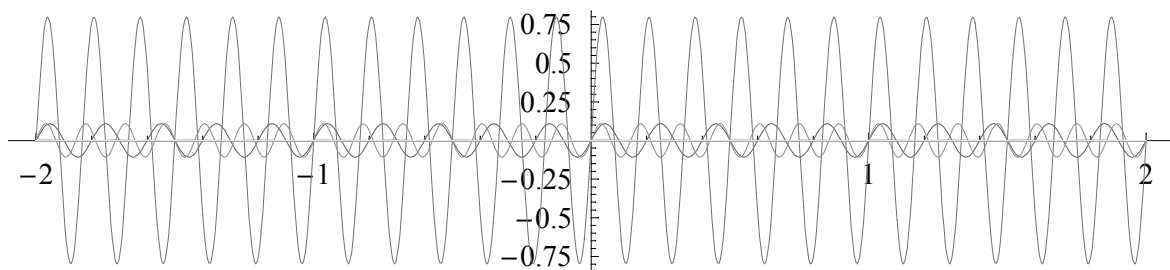
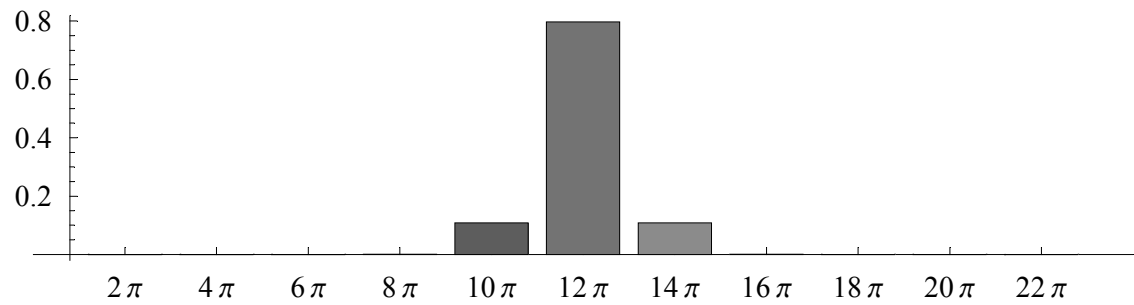


$$\Delta x = 1/2\pi, \Delta k = 2\pi, k_1 = 0, k_0 = 12\pi$$

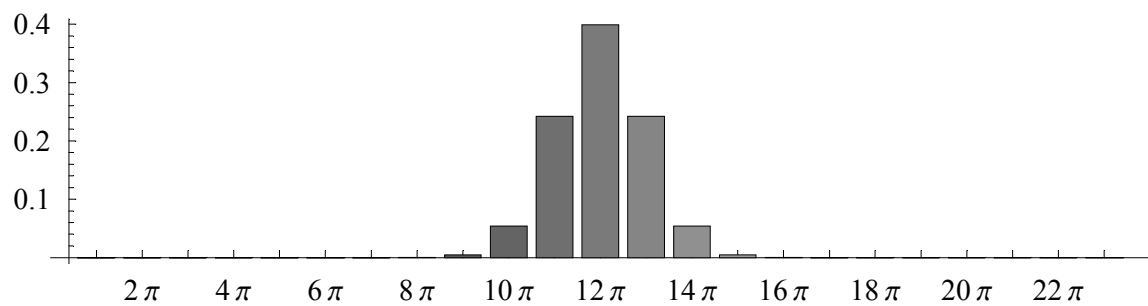


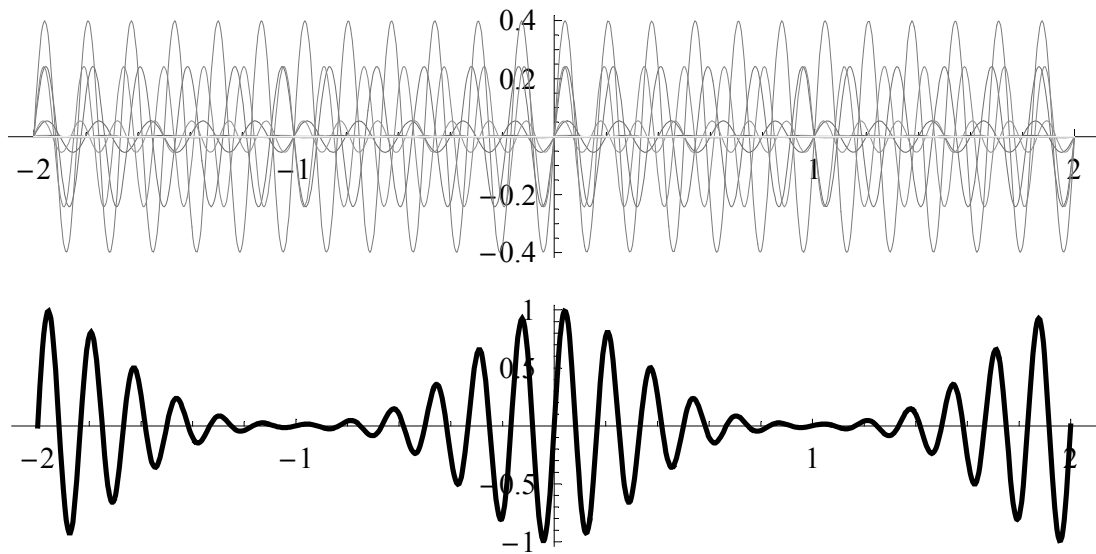


$$\Delta x = 1/1\pi, \Delta k = 1\pi, k_1 = 2\pi/1, k_0 = 12\pi$$

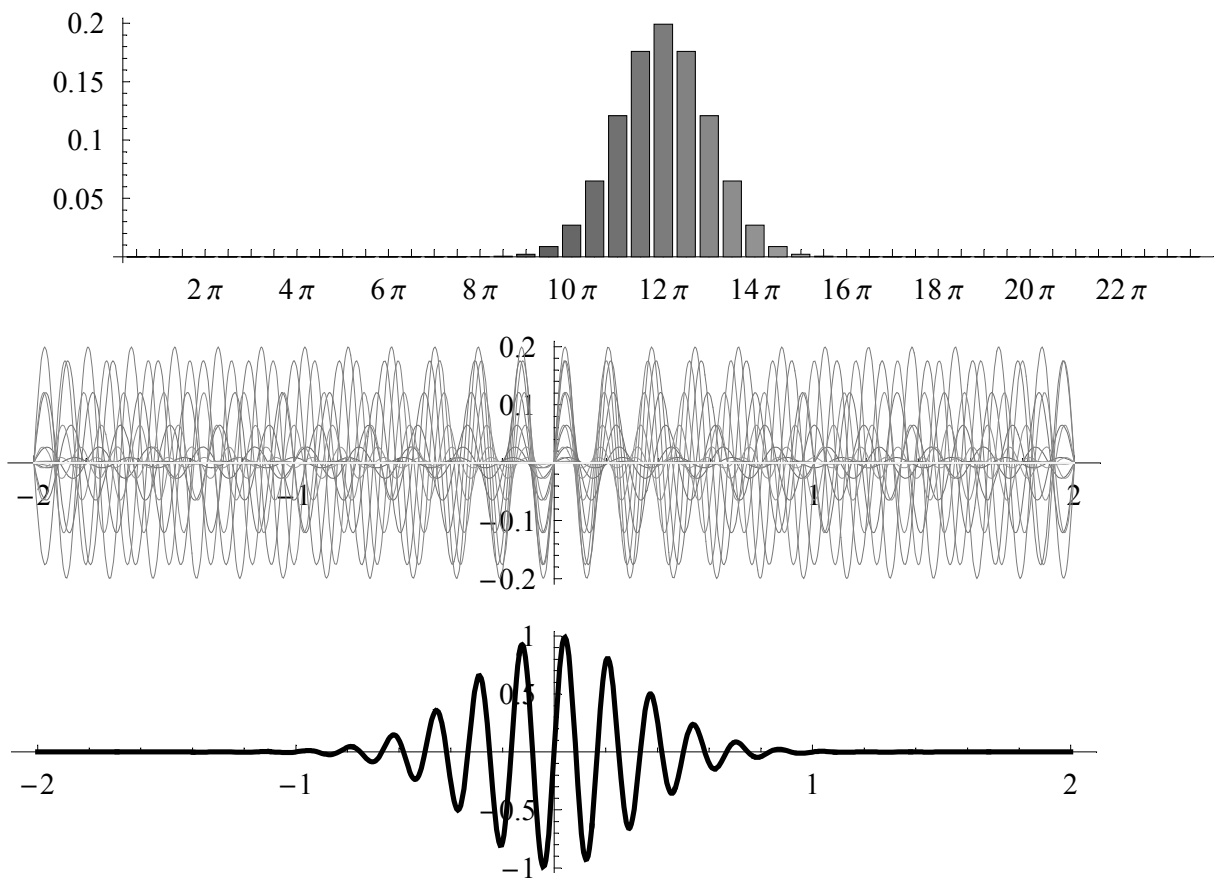


$$\Delta x = 1/1\pi, \Delta k = 1\pi, k_1 = 2\pi/2, k_0 = 12\pi$$

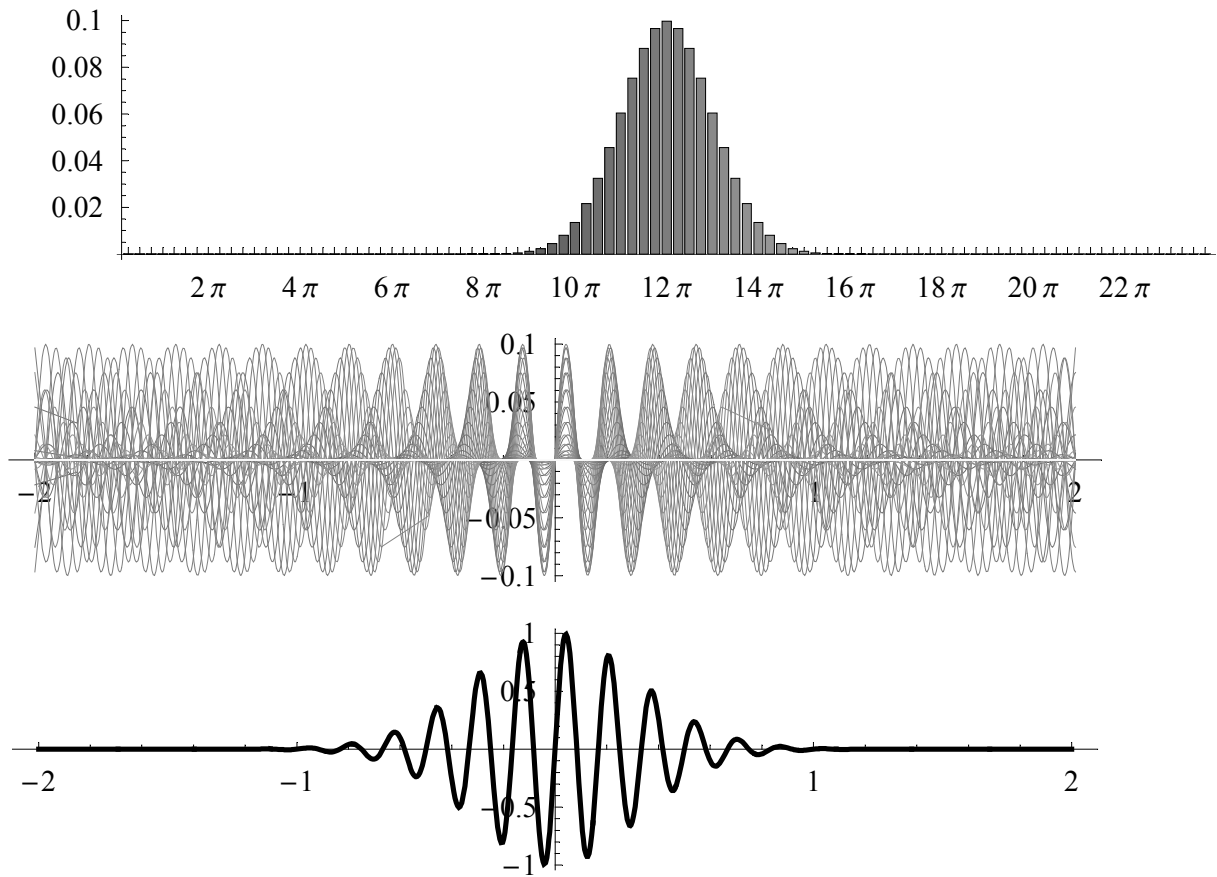




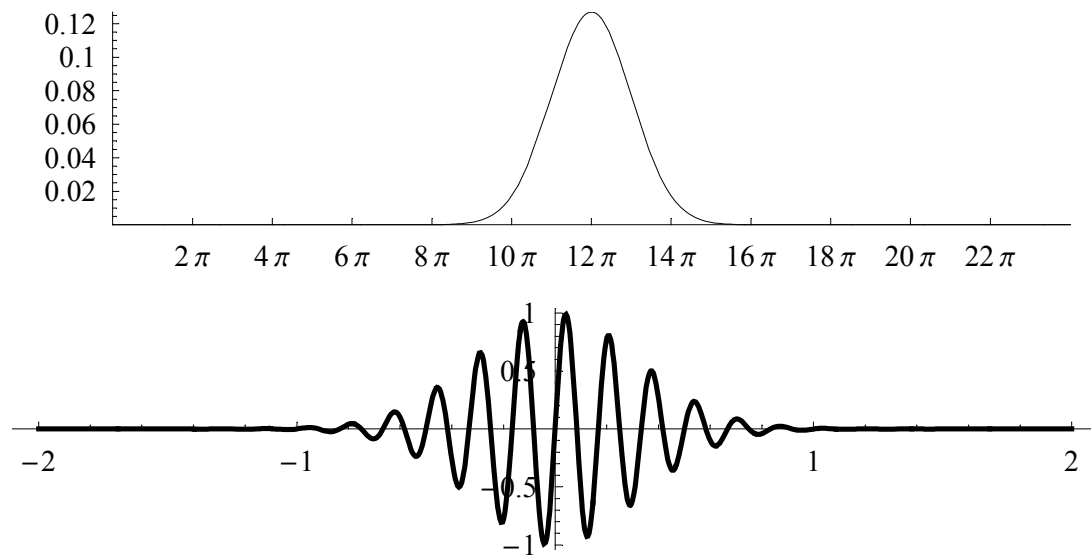
$$\Delta x = 1/1\pi, \Delta k = 1\pi, k_1 = 2\pi/4, k_0 = 12\pi$$



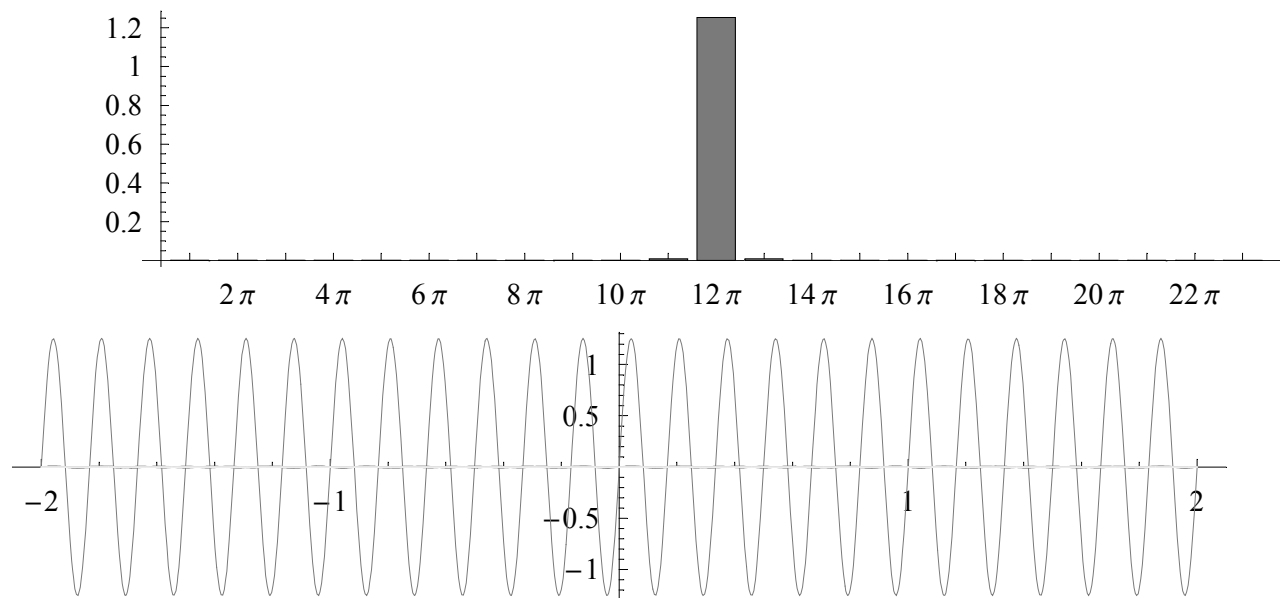
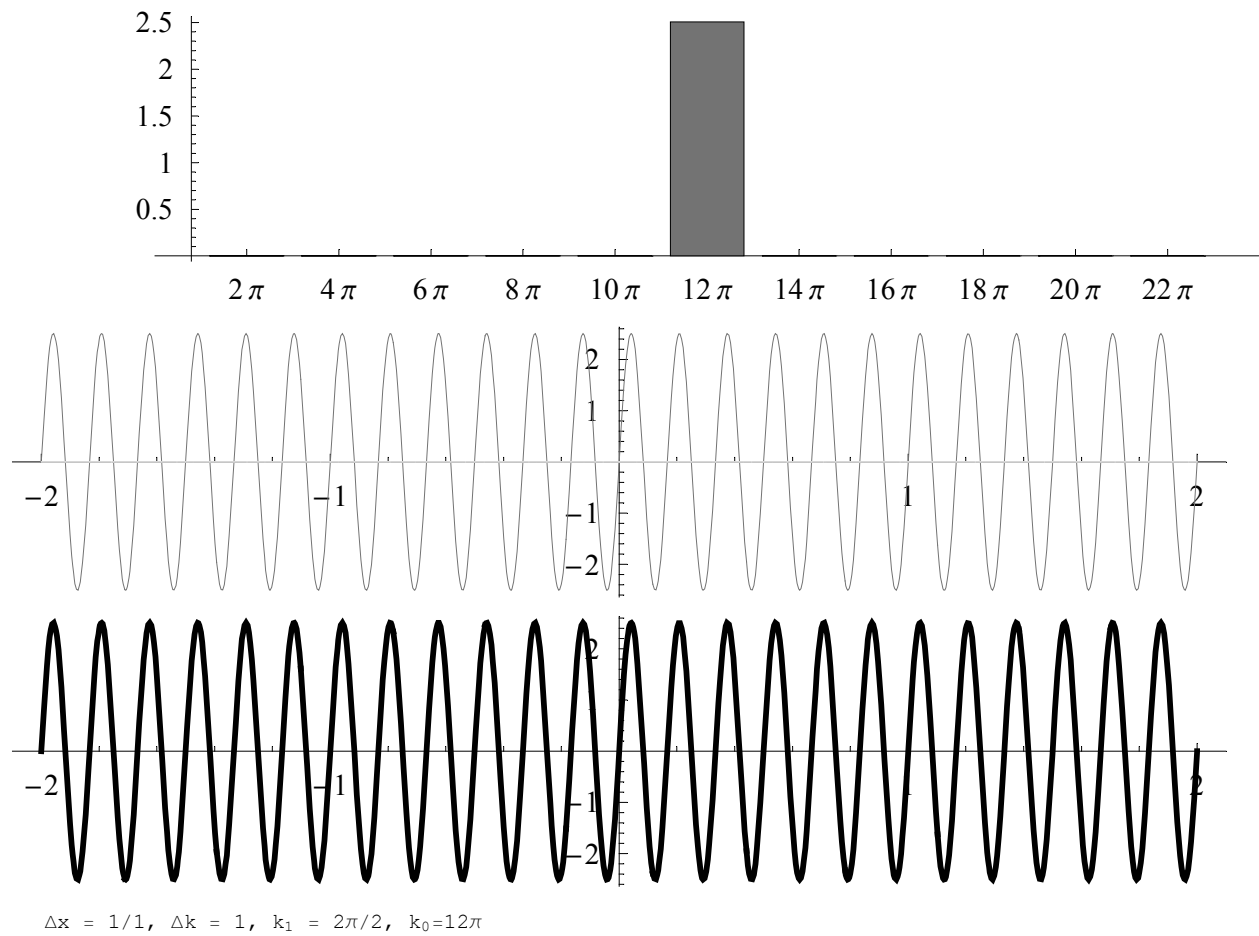
$$\Delta x = 1/1\pi, \Delta k = 1\pi, k_1 = 2\pi/8, k_0 = 12\pi$$

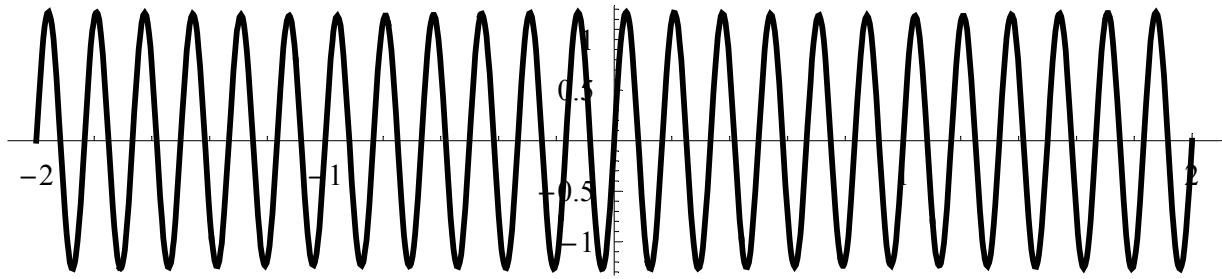


$$\Delta x = 1/1\pi, \Delta k = 1\pi, k_1 = 0, k_0 = 12\pi$$

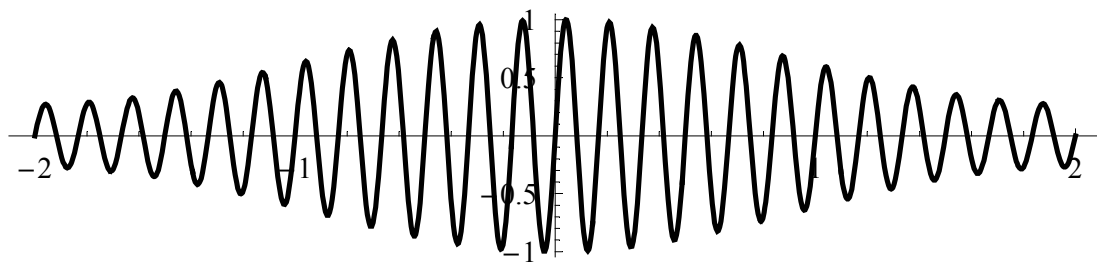
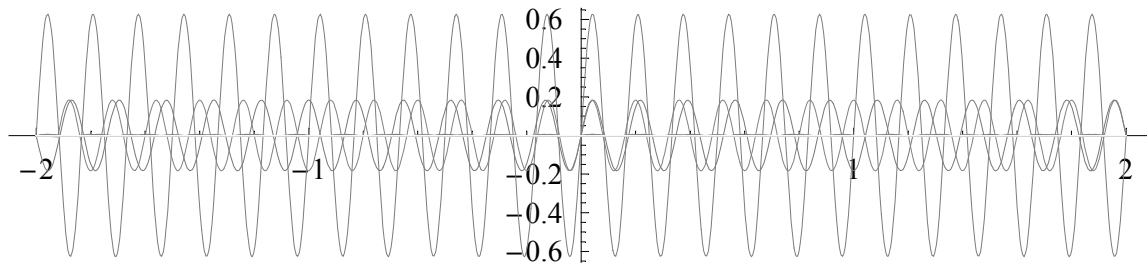
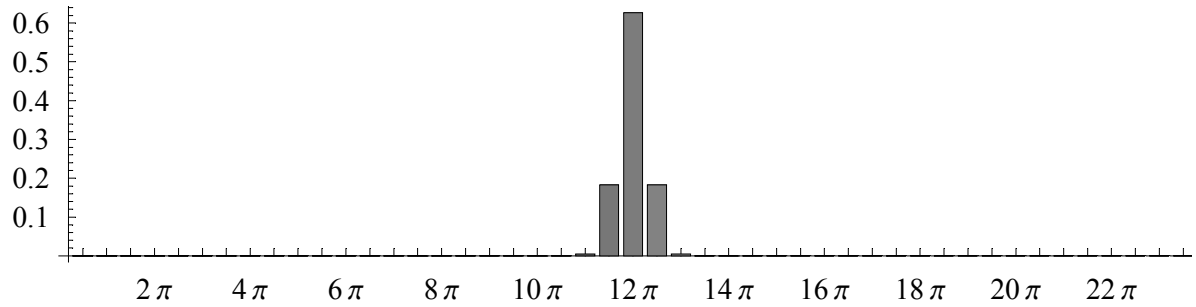


$$\Delta x = 1/1, \Delta k = 1, k_1 = 2\pi/1, k_0 = 12\pi$$

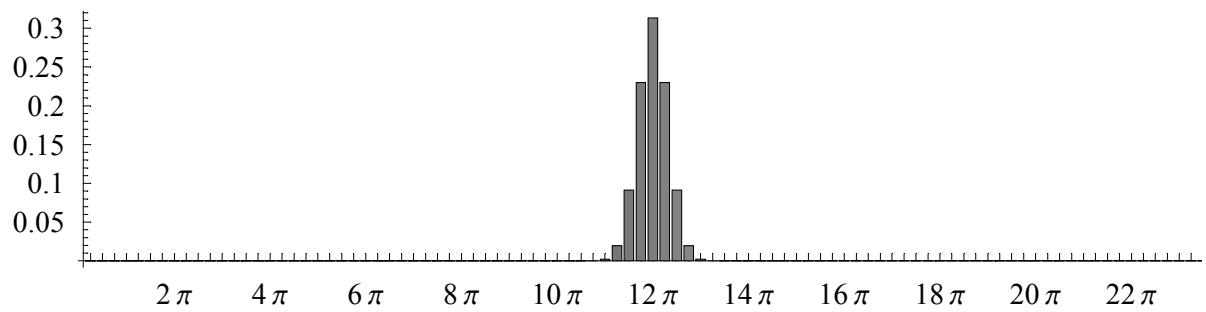


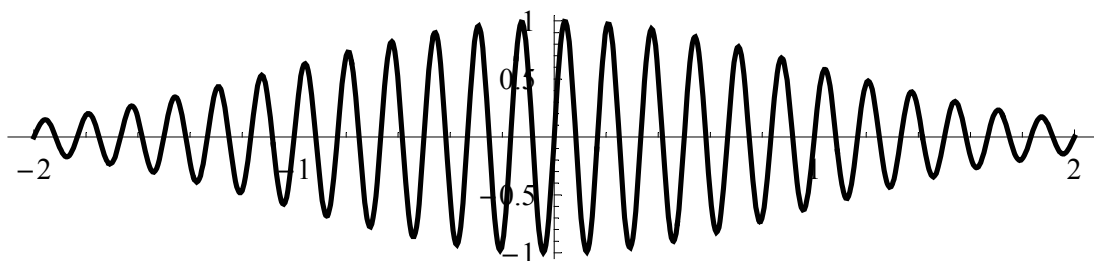
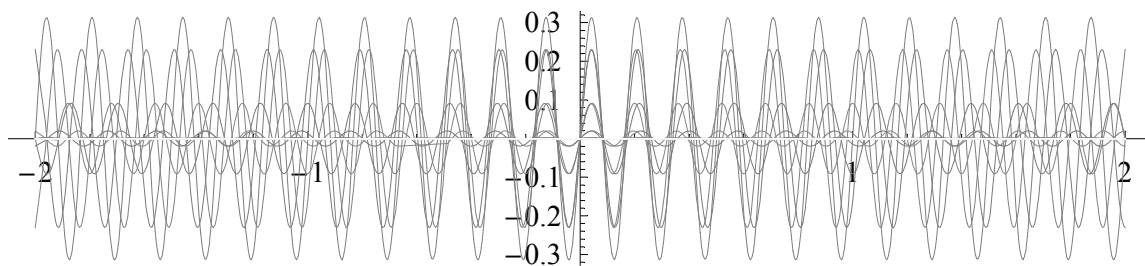


$$\Delta x = 1/1, \Delta k = 1, k_1 = 2\pi/4, k_0 = 12\pi$$

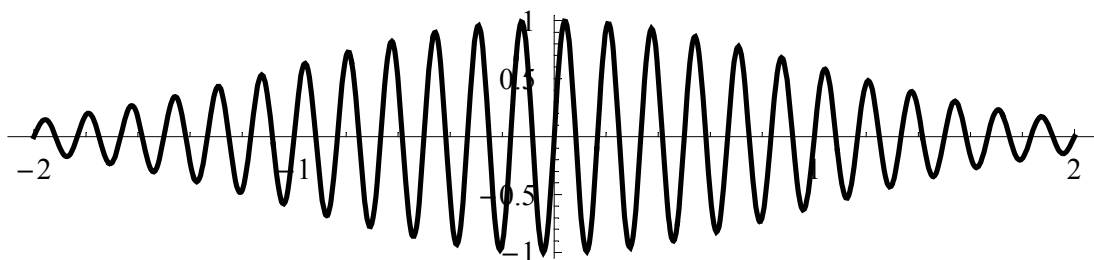
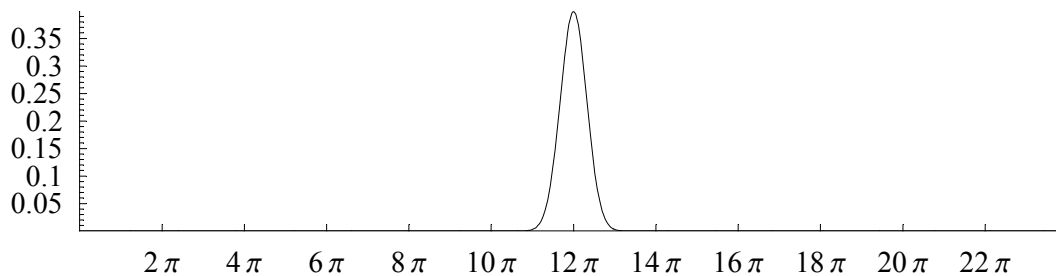


$$\Delta x = 1/1, \Delta k = 1, k_1 = 2\pi/8, k_0 = 12\pi$$



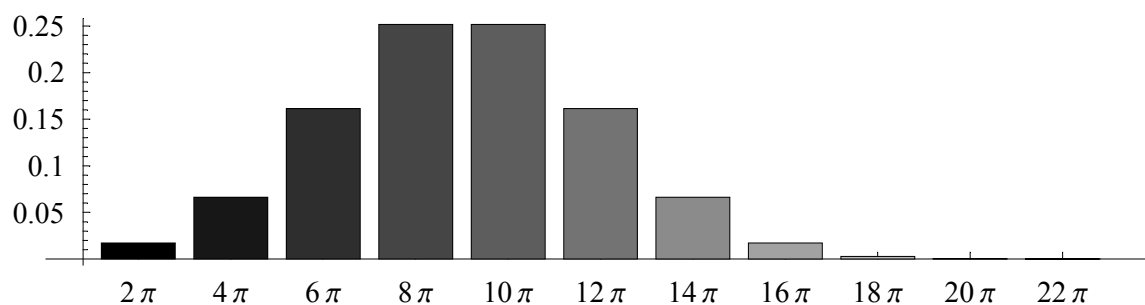


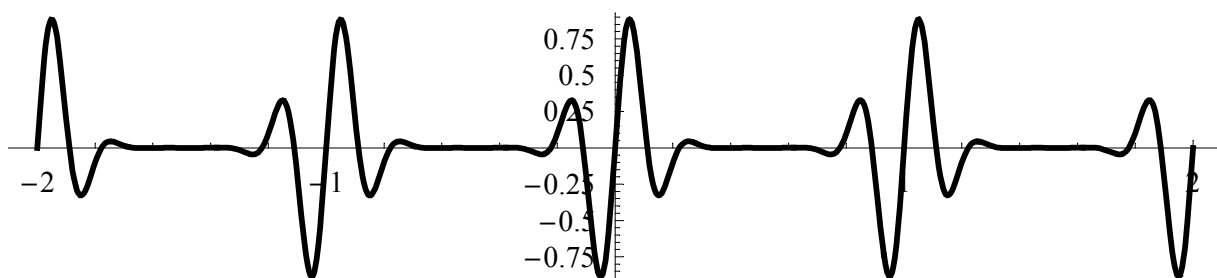
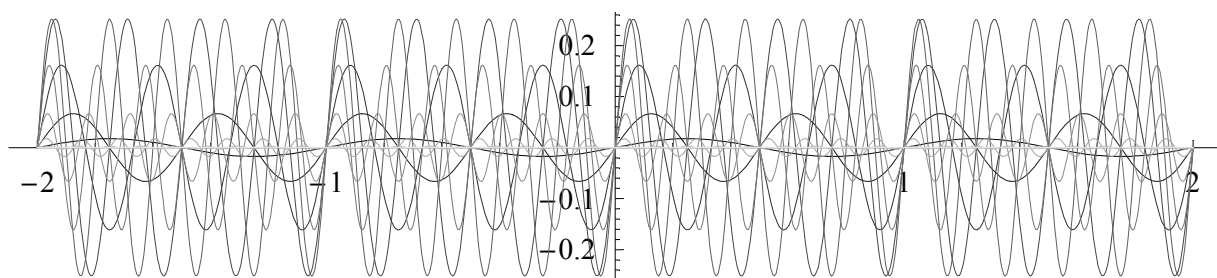
$\Delta x = 1/1, \Delta k = 1, k_1 = 0, k_0 = 12\pi$



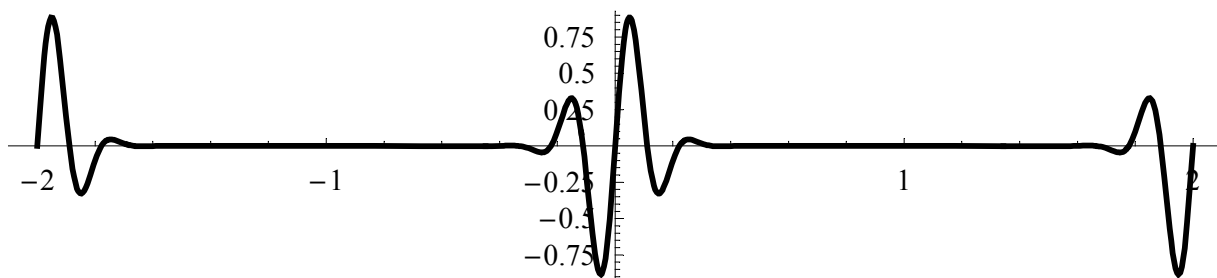
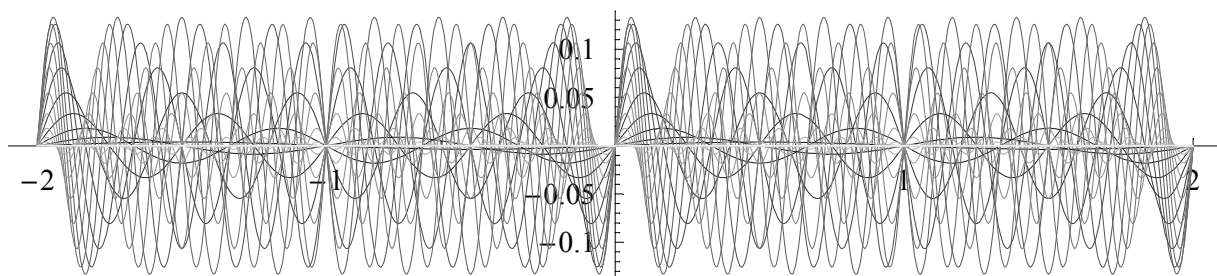
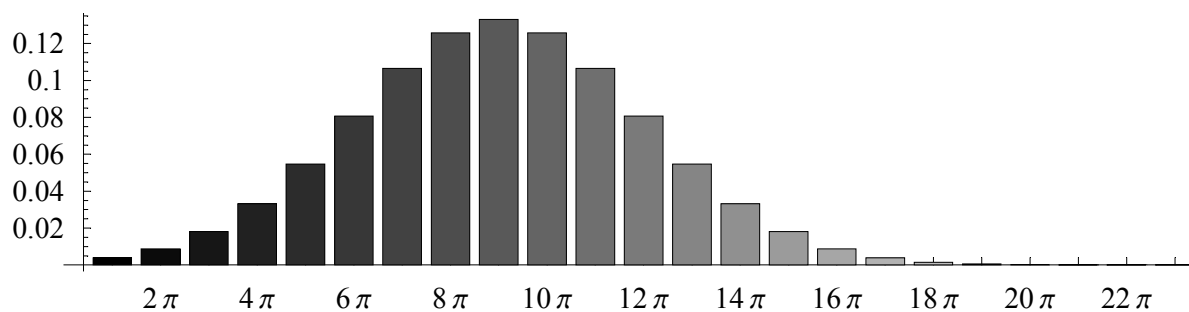
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In[23]:= makeplot[3 π, 9 π];
         makeplot[3 π, 15 π];
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$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/1, k_0 = 9\pi$

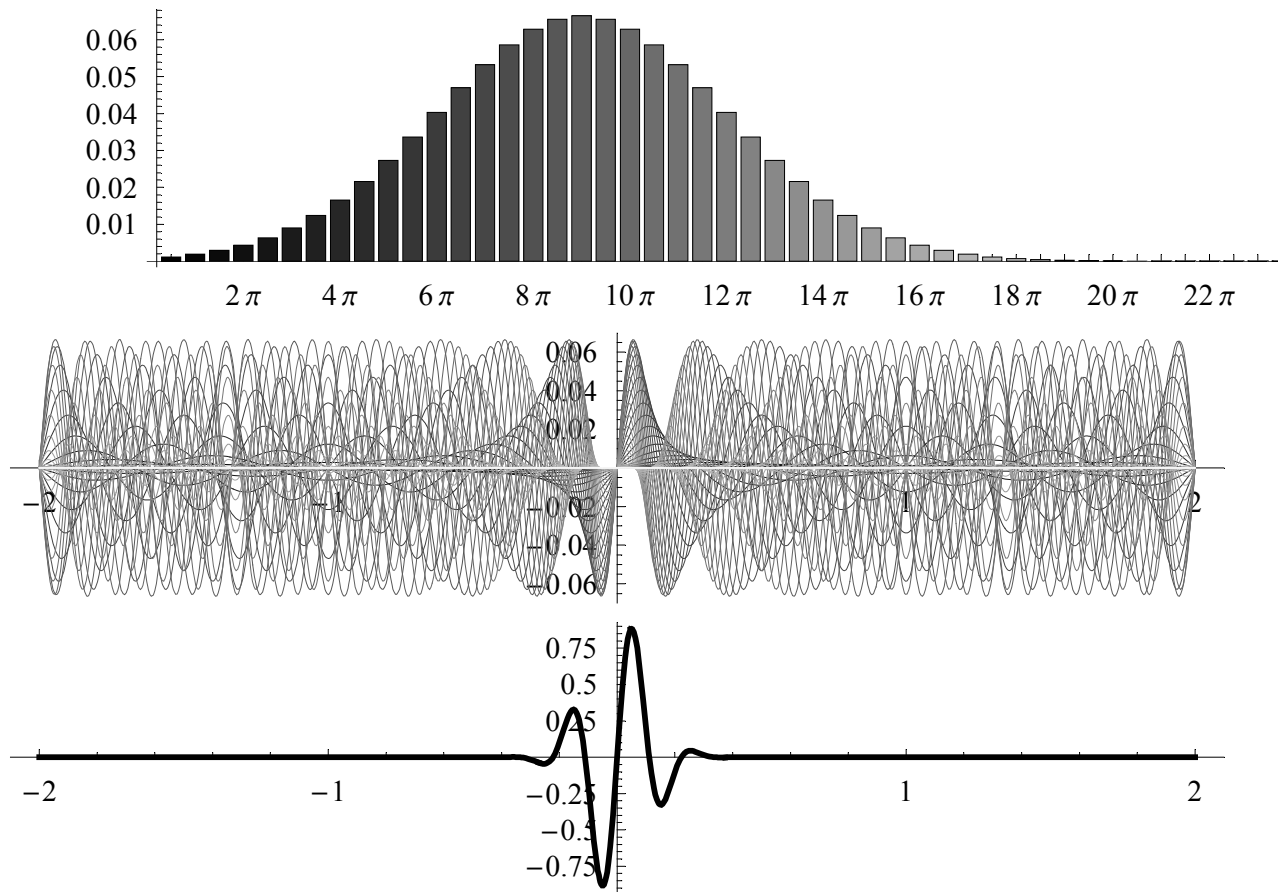




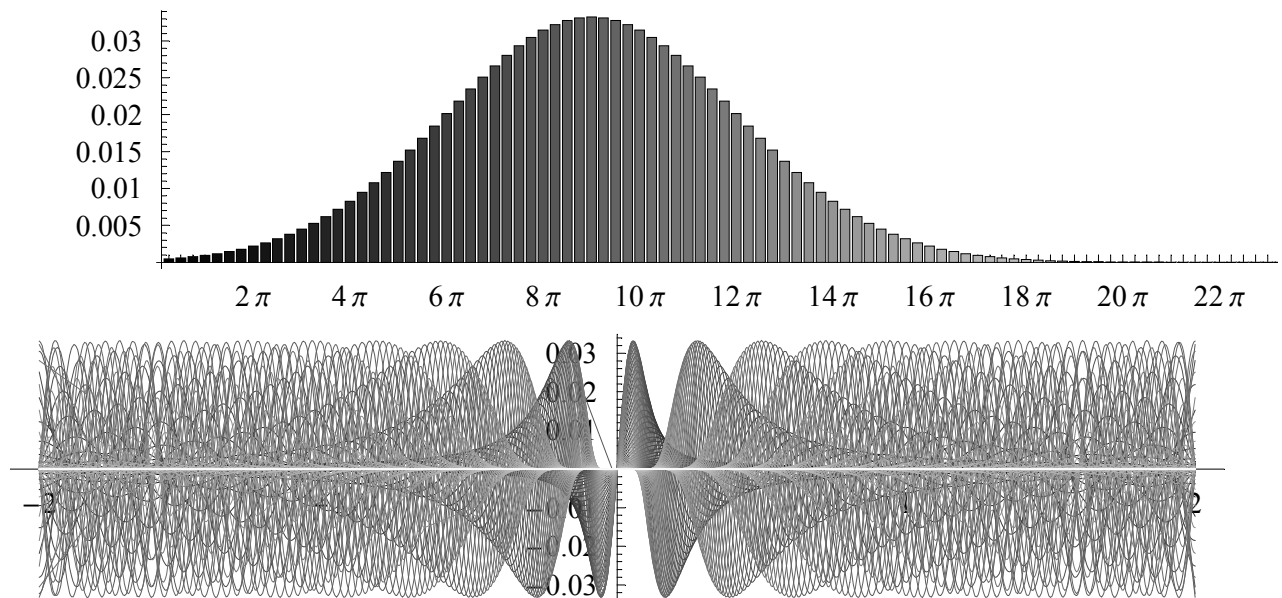
$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/2, k_0 = 9\pi$$

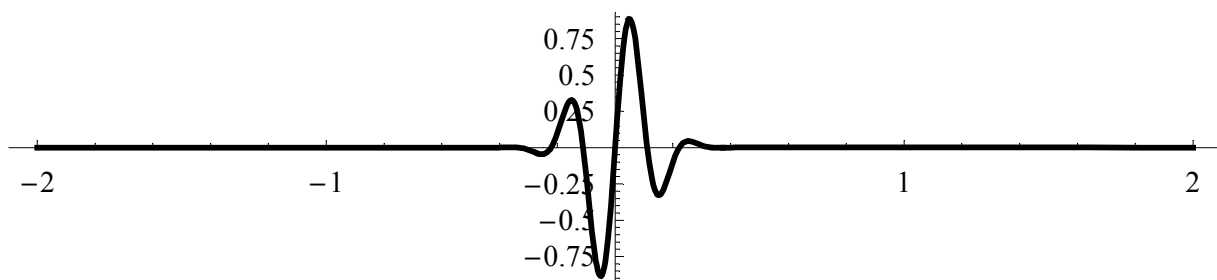


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/4, k_0 = 9\pi$$

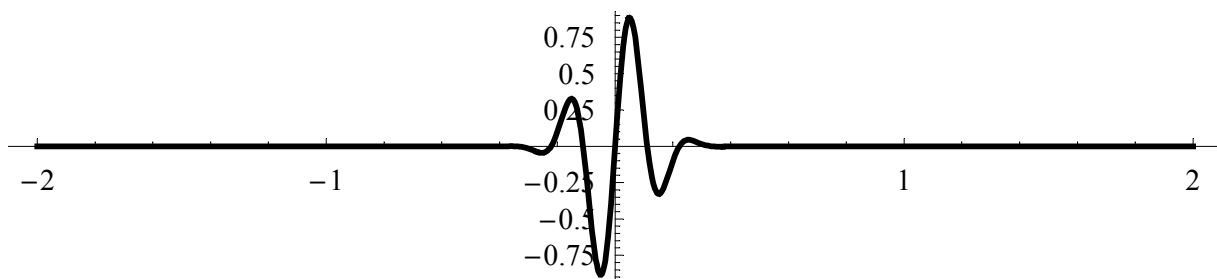
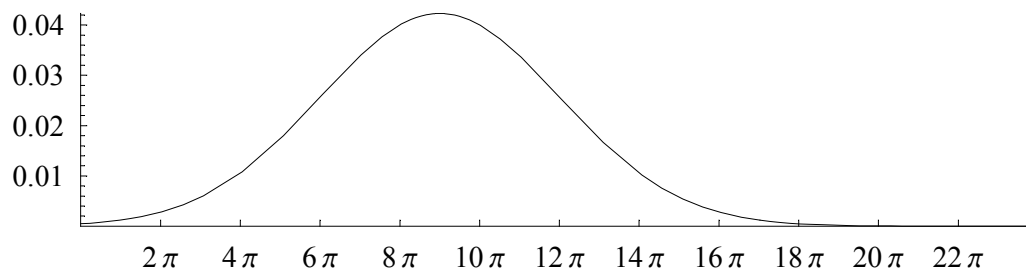


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/8, k_0 = 9\pi$$

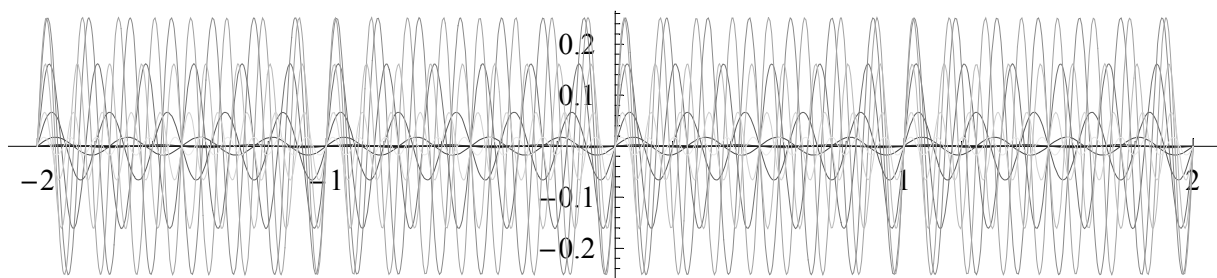
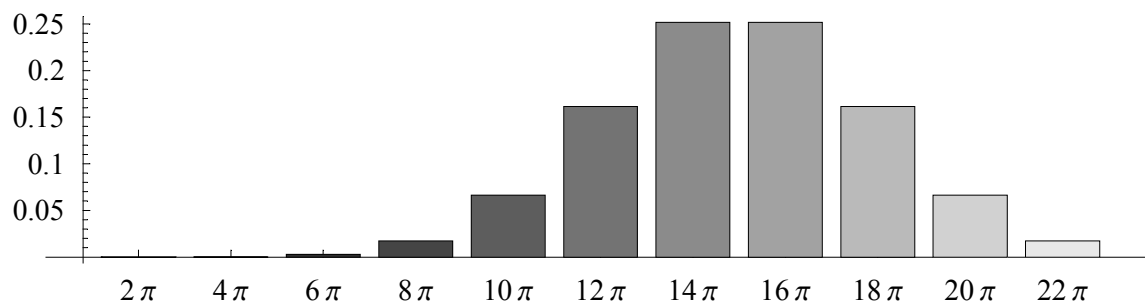


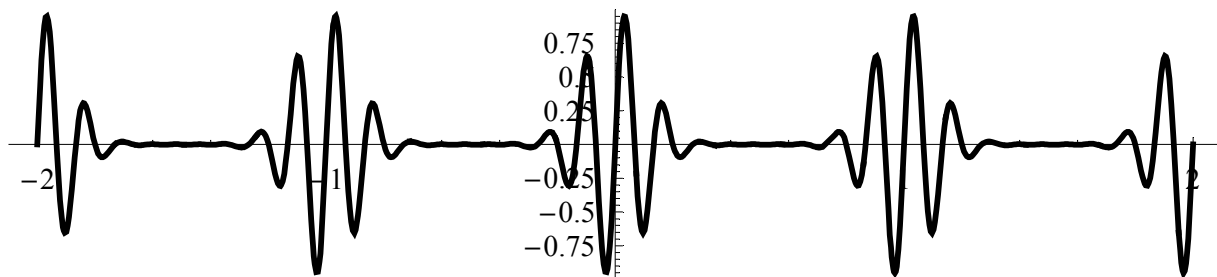


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 0, k_0 = 9\pi$$

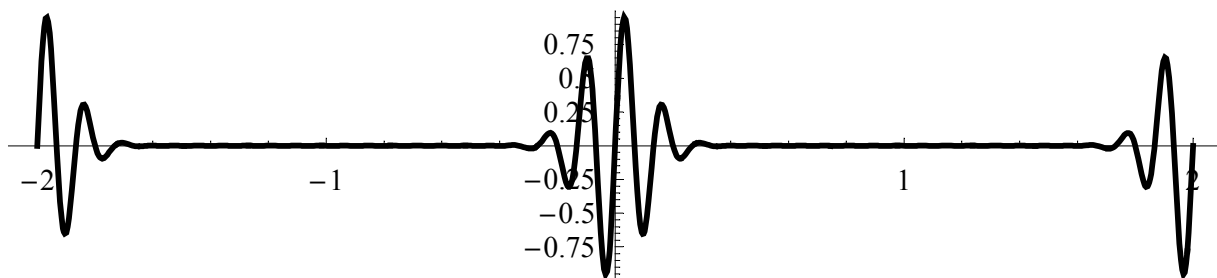
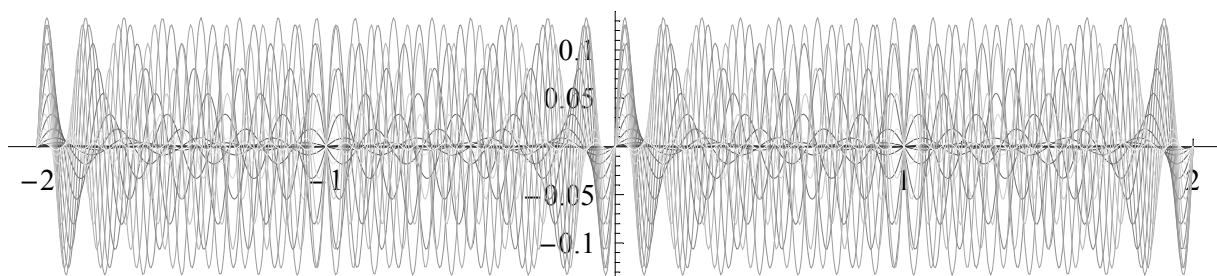
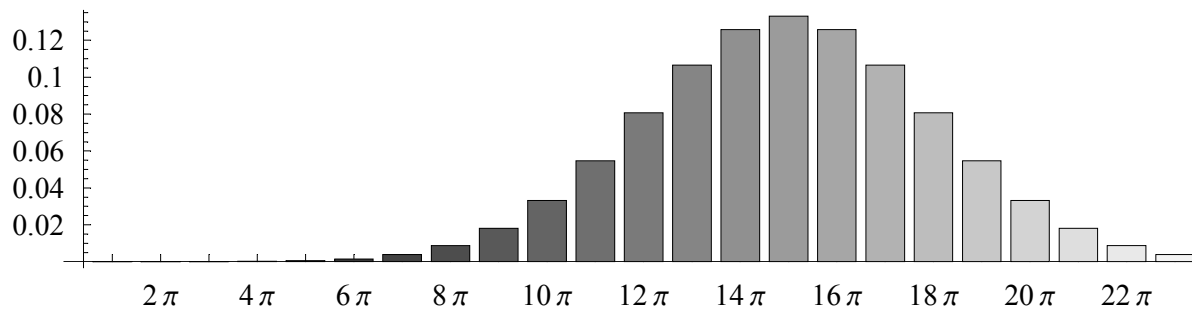


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/1, k_0 = 15\pi$$

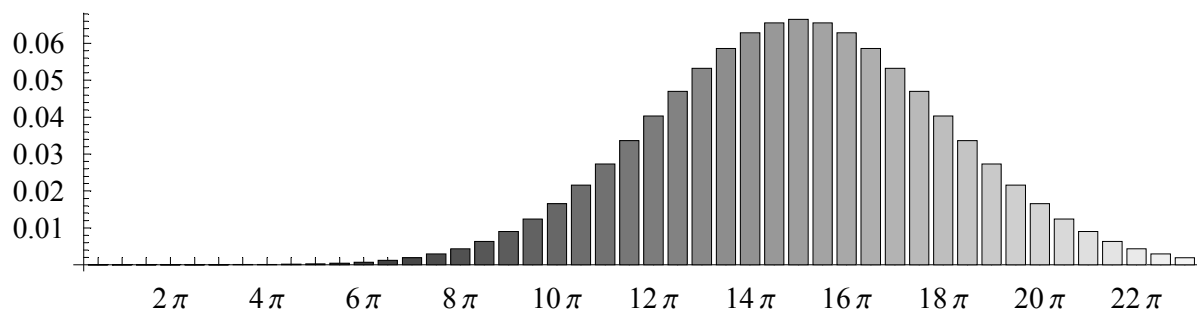


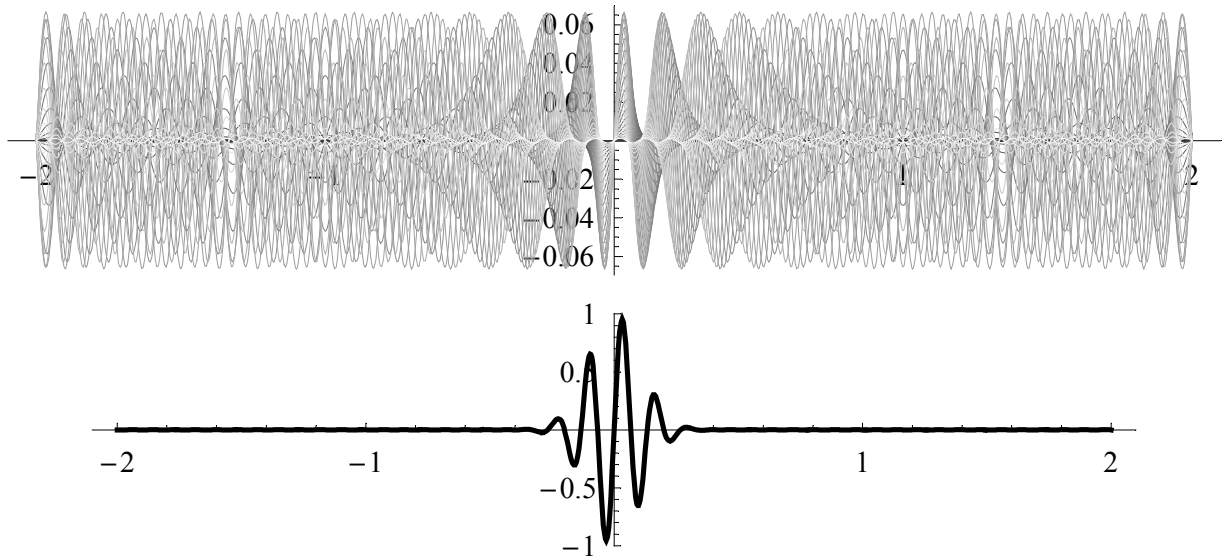


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/2, k_0 = 15\pi$$

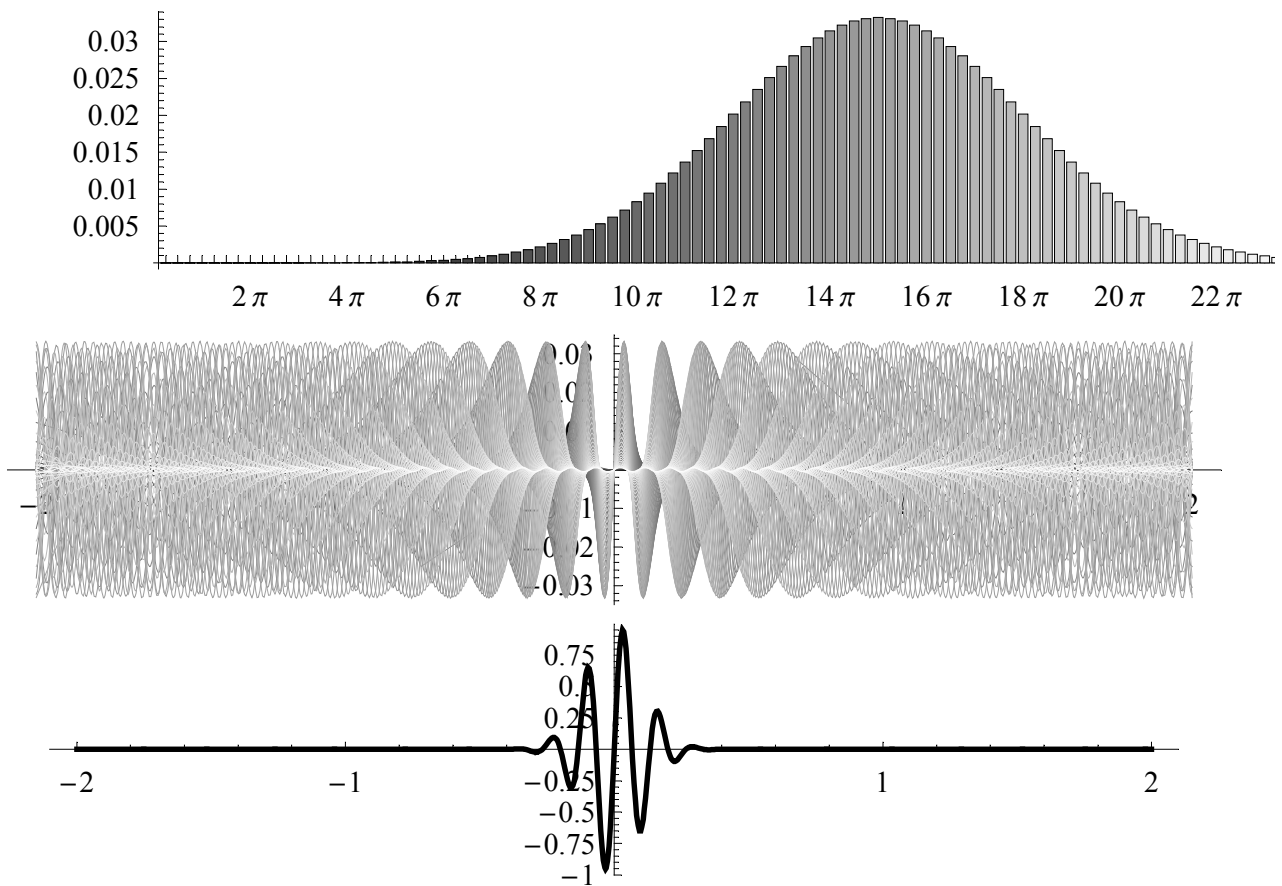


$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/4, k_0 = 15\pi$$





$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 2\pi/8, k_0 = 15\pi$$



$$\Delta x = 1/3\pi, \Delta k = 3\pi, k_1 = 0, k_0 = 15\pi$$

