```mathematica
In[1]:= max = 30;
        (*
        f=Abs[t];
        f=t;
        f=t^2;
        f=If[t>0,1,0];
        f=If[t==0,0,Sin[1/t]];  dla tej funkcji trzeba calkowac numeryczne NIntegrate *)
        f = If[t > 0, t, 1];

In[3]:= (* Wyraz staly *)
        a = Integrate[f, {t, -Pi, Pi}] / (2 Pi)

Out[3]= (2 + π)/4

In[4]:= (* Wspolczynniki przy cosinusach *)
        b = Table[Integrate[f Cos[k t], {t, -Pi, Pi}] / Pi, {k, 1, max}]

Out[4]= {-2/π, 0, -2/(9 π), 0, -2/(25 π), 0, -2/(49 π), 0, -2/(81 π), 0, -2/(121 π), 0, -2/(169 π), 0, -2/(225 π), 0,
         -2/(289 π), 0, -2/(361 π), 0, -2/(441 π), 0, -2/(529 π), 0, -2/(625 π), 0, -2/(729 π), 0, -2/(841 π), 0}
```
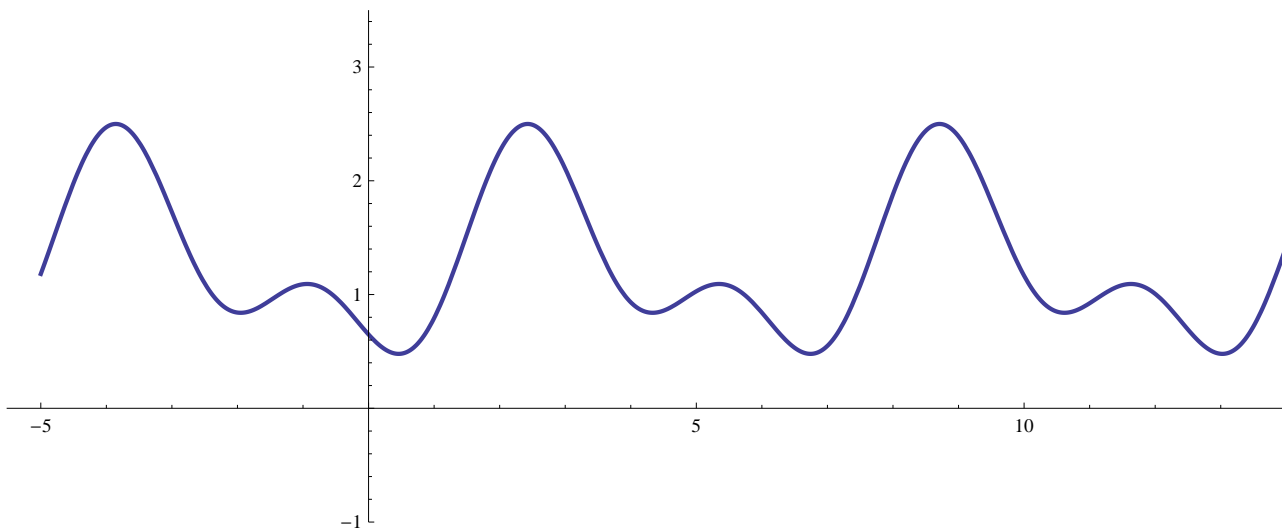
In[5]:= (* Wspolczynniki przy sinusach *)
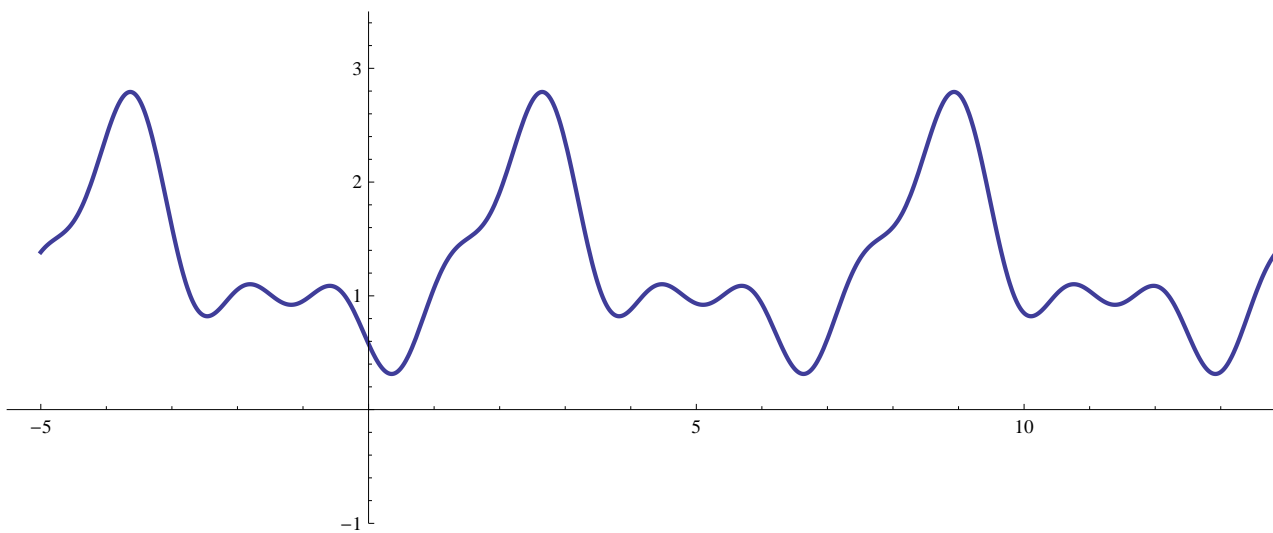   c = Table[Integrate[f Sin[k t], {t, -Pi, Pi}] / Pi, {k, 1, max}]

$$Out[5]= \left\{\frac{-2+\pi}{\pi}, -\frac{1}{2}, \frac{-2+\pi}{3\pi}, -\frac{1}{4}, \frac{-2+\pi}{5\pi}, -\frac{1}{6}, \frac{-2+\pi}{7\pi}, -\frac{1}{8}, \frac{-2+\pi}{9\pi}, -\frac{1}{10}, \right.$$

$$\frac{-2+\pi}{11\pi}, -\frac{1}{12}, \frac{-2+\pi}{13\pi}, -\frac{1}{14}, \frac{-2+\pi}{15\pi}, -\frac{1}{16}, \frac{-2+\pi}{17\pi}, -\frac{1}{18}, \frac{-2+\pi}{19\pi}, -\frac{1}{20},$$

$$\left. \frac{-2+\pi}{21\pi}, -\frac{1}{22}, \frac{-2+\pi}{23\pi}, -\frac{1}{24}, \frac{-2+\pi}{25\pi}, -\frac{1}{26}, \frac{-2+\pi}{27\pi}, -\frac{1}{28}, \frac{-2+\pi}{29\pi}, -\frac{1}{30} \right\}$$

```mathematica
In[6]:= (* Rzut funkcji f na przestrzen rozpieta przez sin(kt) i cos (kt) dla k≤n *)
        Do[
          fa[n_] := a + Sum[b[[k]] Cos[k t] + c[[k]] Sin[k t], {k, 1, n}];
          Print["n=", n, " : ", Plot[fa[n], {t, - 5, 20}, PlotStyle → Thick,
            PlotRange → {-1, 3.5}, ImageSize → 800, AspectRatio → 0.3]], {n, 2, max, 2}];
```
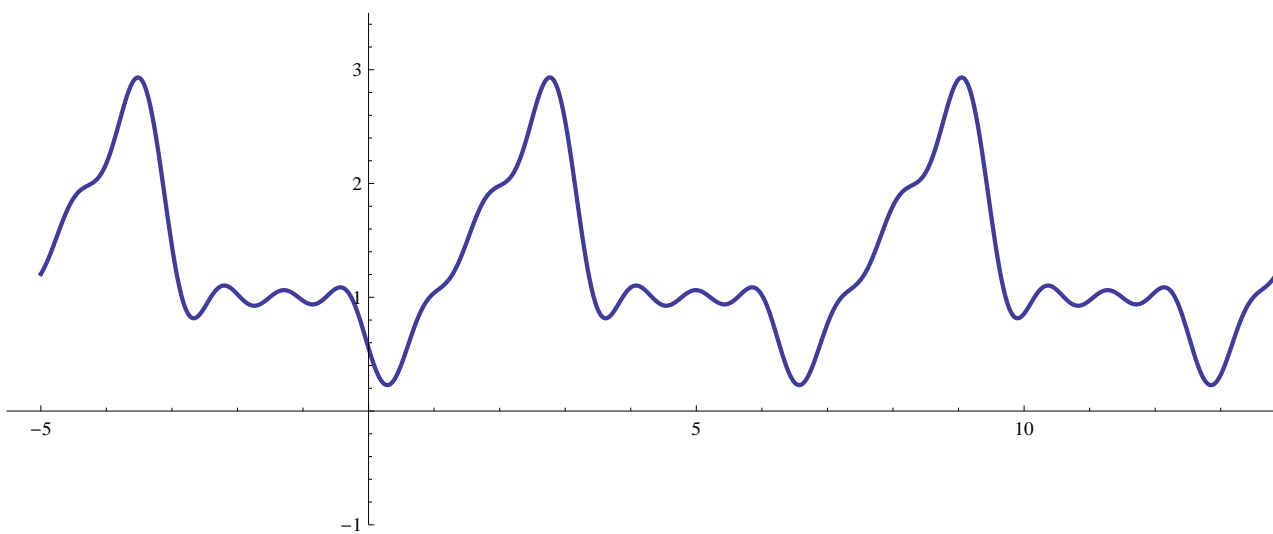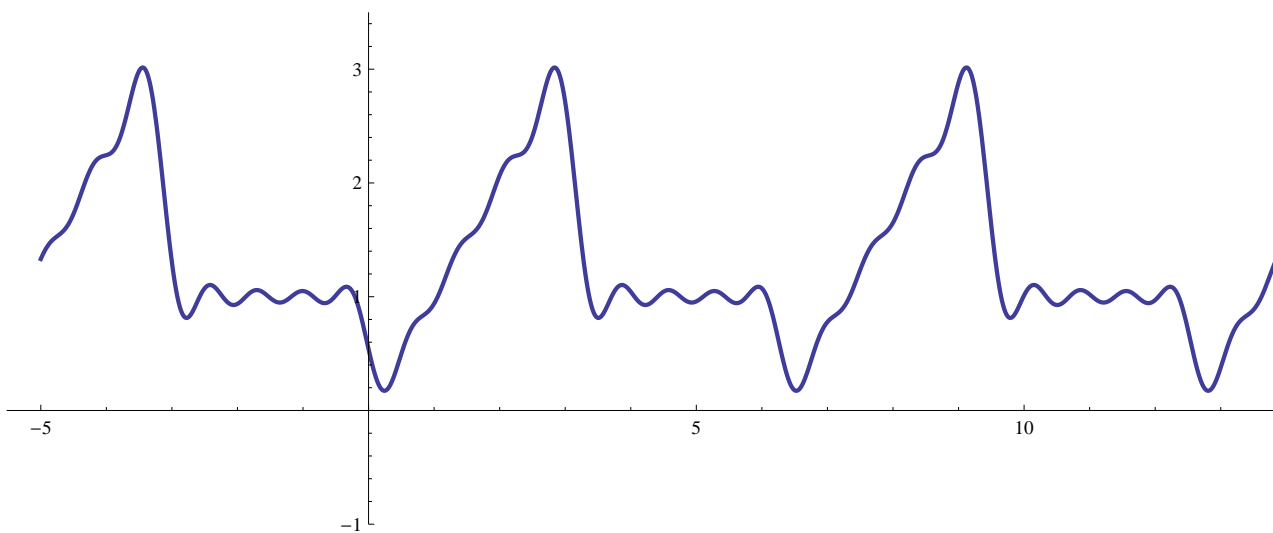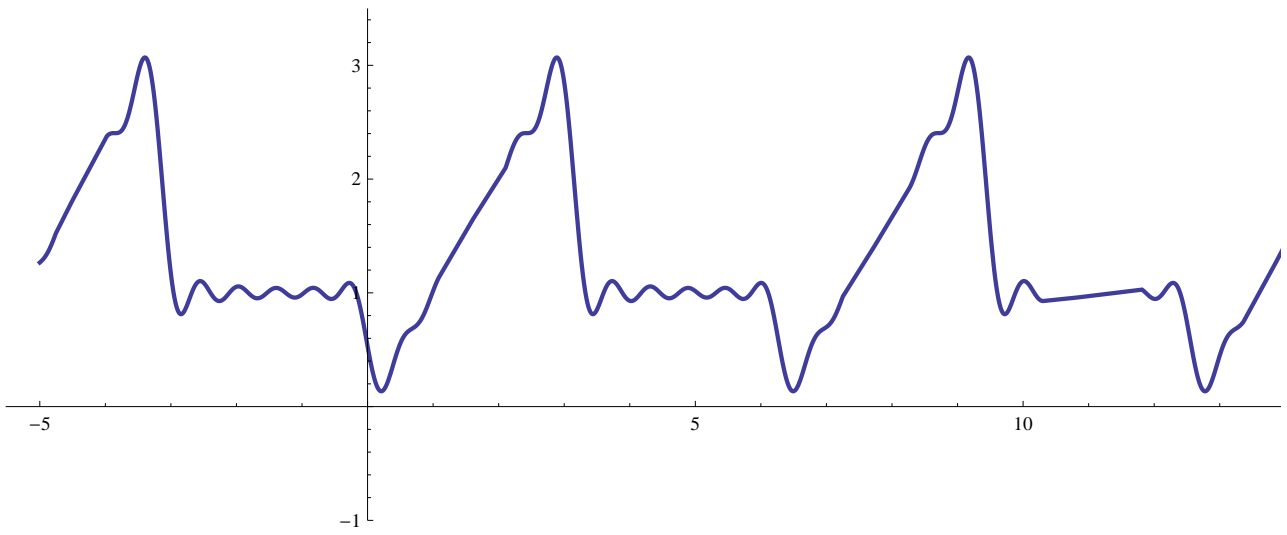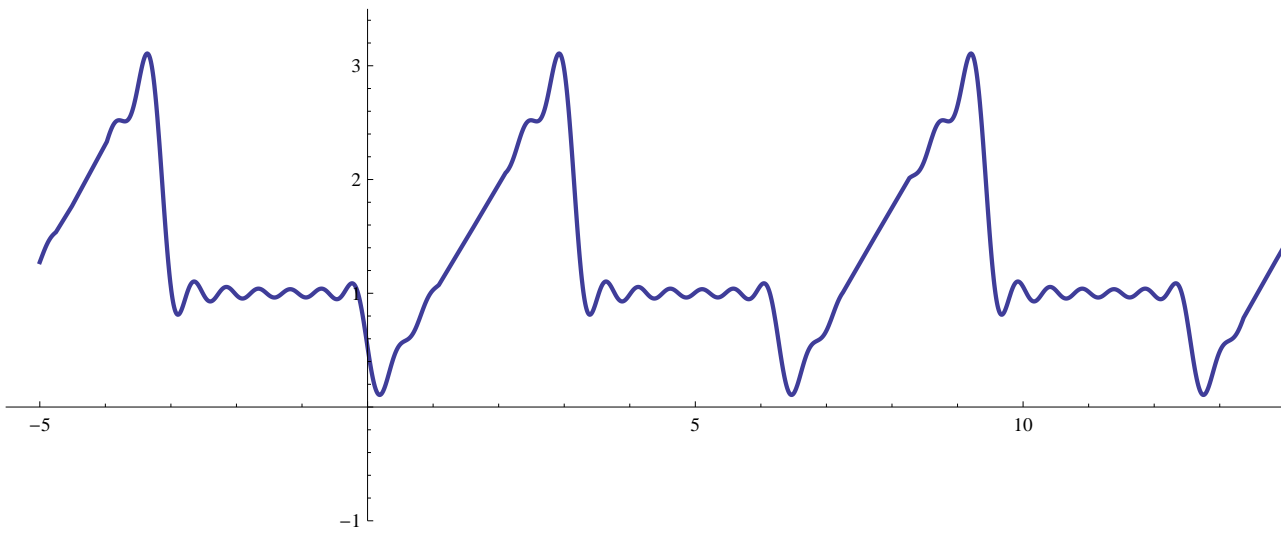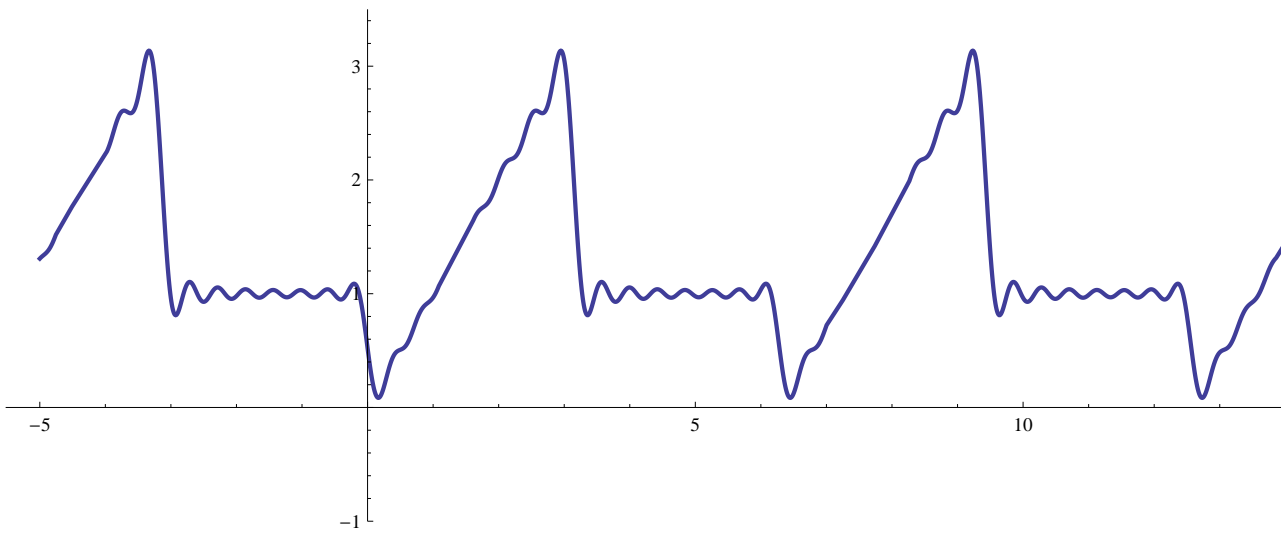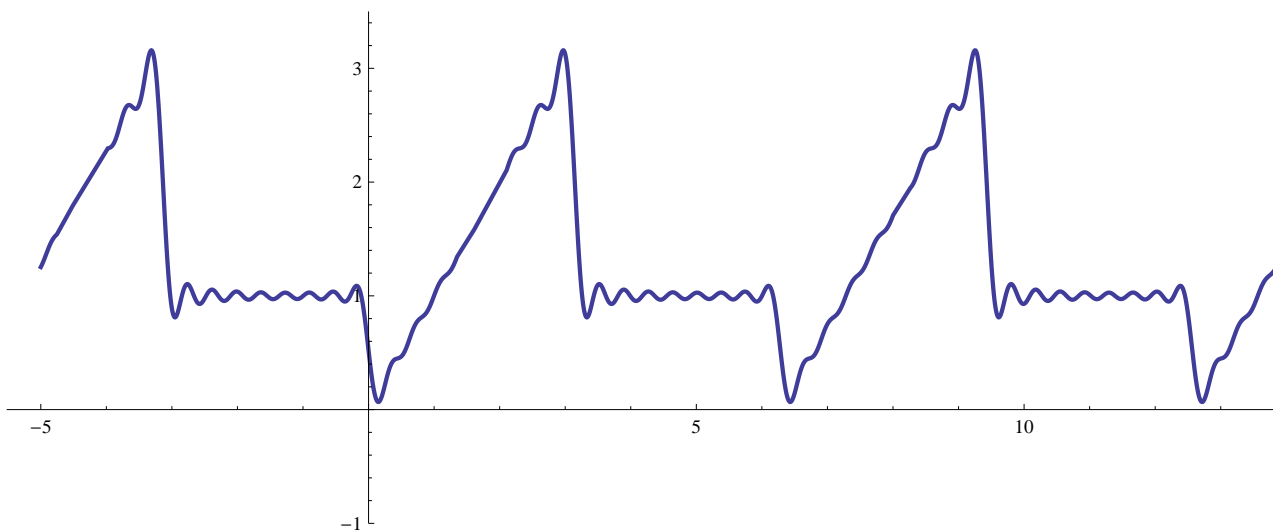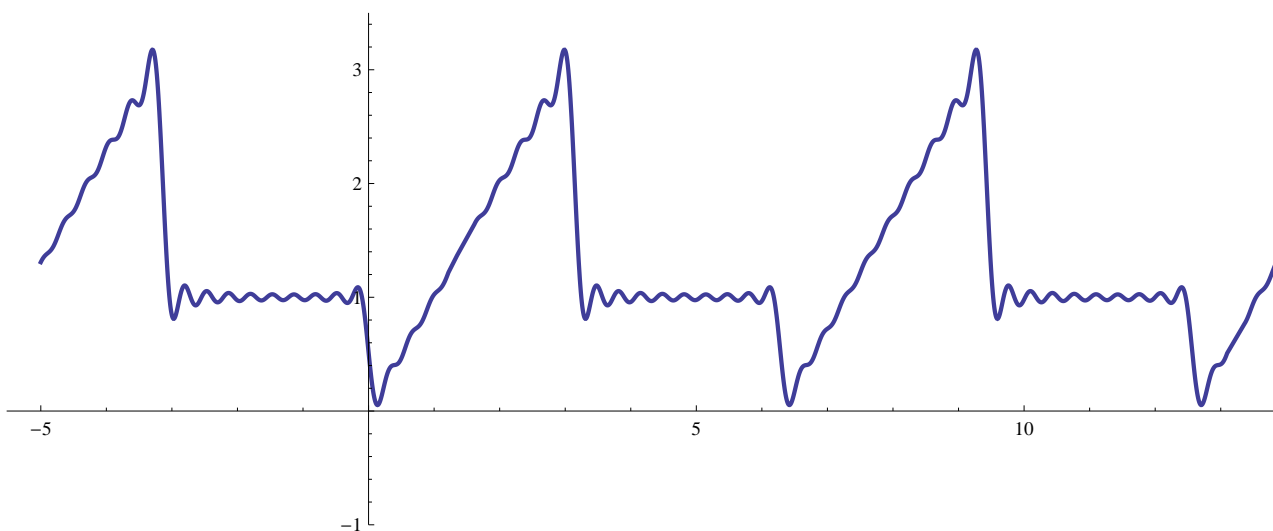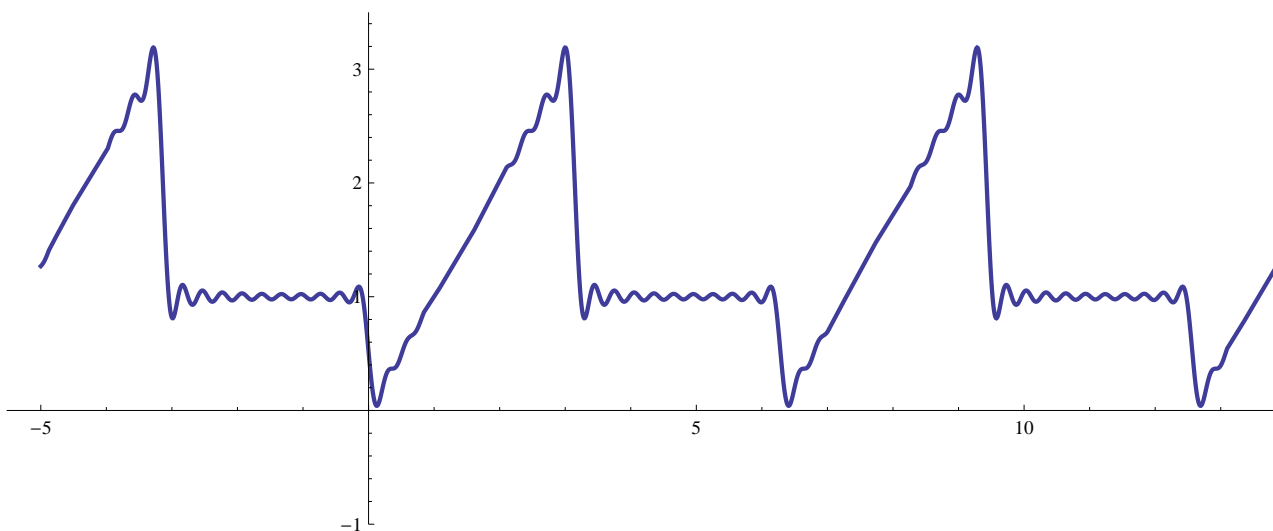
n=2 :

n=4 :

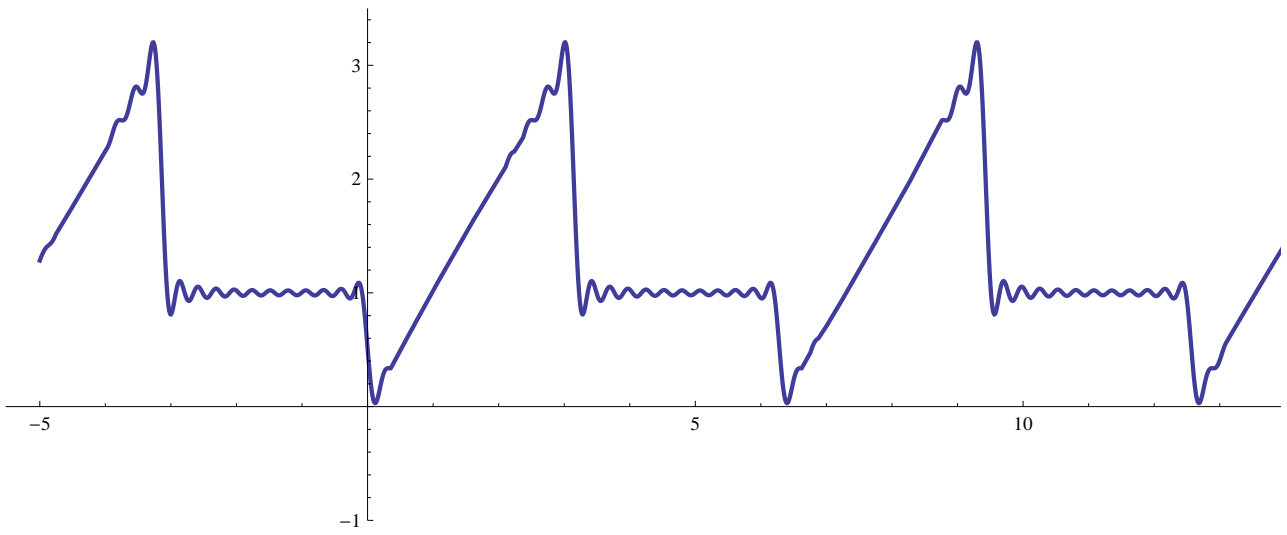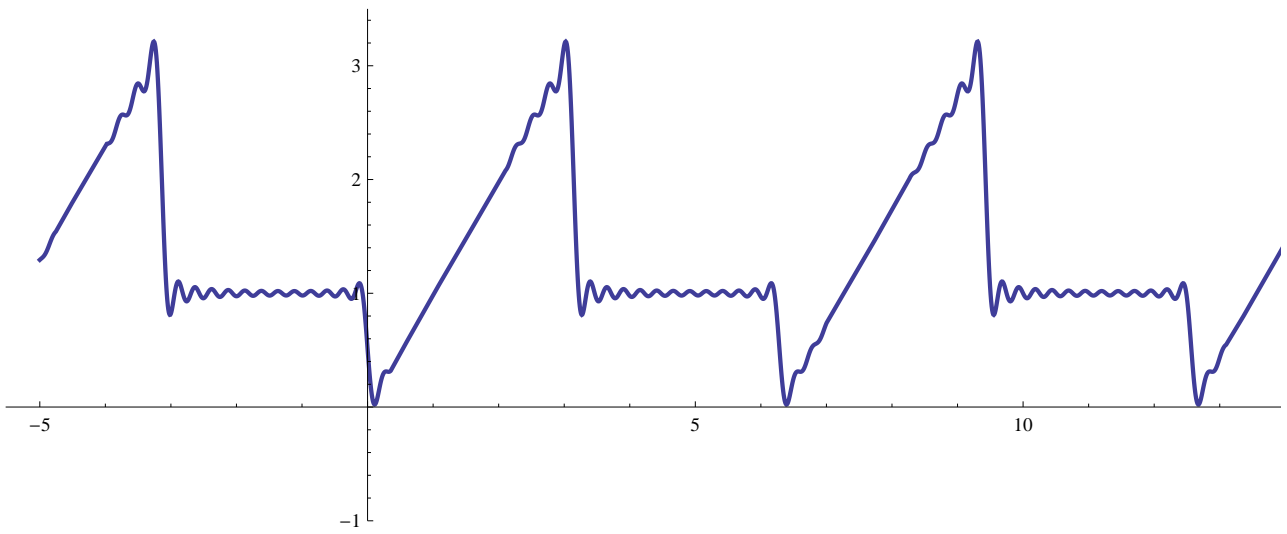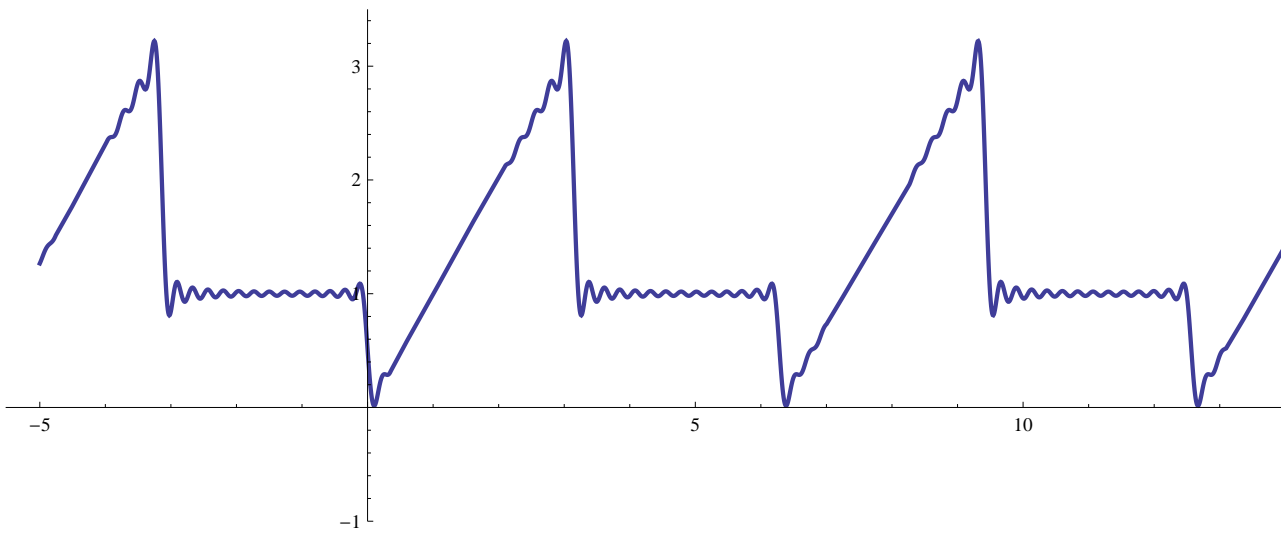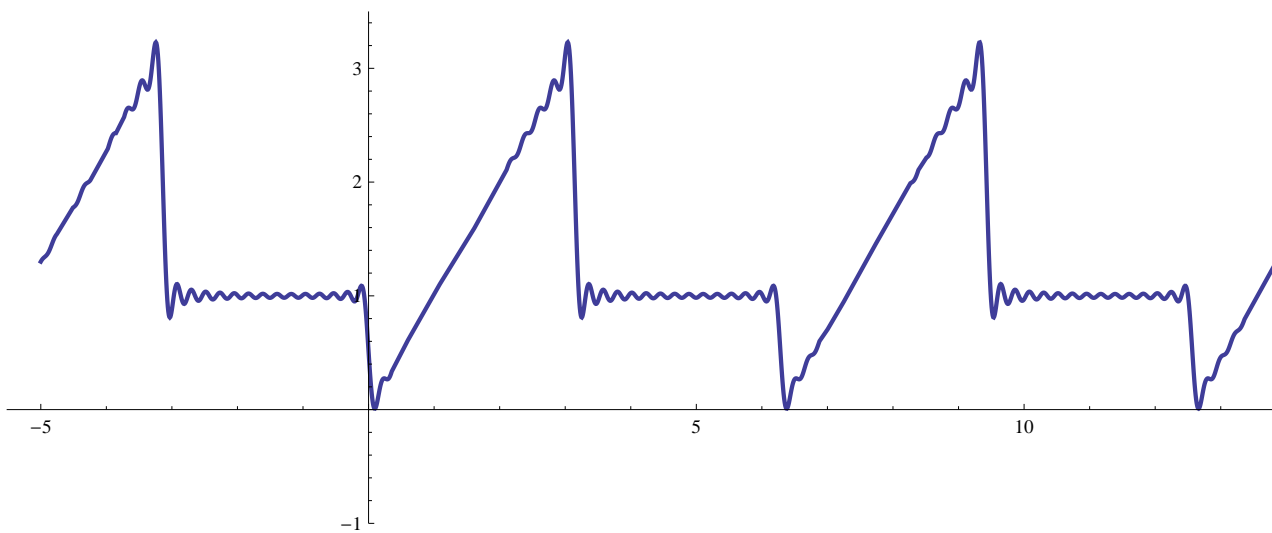n=6 :

n=8 :

n=10 :

n=12 :

n=14 :

n=16 :

n=18 :

n=20 :

n=22 :

n=24 :

n=26 :

n=28 :

n=30 :