```
\{x, 0, Pi\}, PlotRange \rightarrow \{-4.5, 5\}, AxesLabel \rightarrow \{"x", "U2n+1"\}, PlotStyle -> Thickness[0.006]]
U2n+1
Show[U2n1, Graphics[{Text["n=3", {0.3, 4.6}], Text["2", {0.5, 4.6}], Text["1", {0.7, 4.6}], Text["0", {0.9, 4.6}]}]]
U2n+1
\{x, 0, Pi\}, PlotRange \rightarrow \{-4.5, 5\}, AxesLabel \rightarrow \{"x", "U2n+2"\}, PlotStyle -> Thickness[0.006]]
U2n+2
Show[U2n2, Graphics[{Text["n=3", {0.25, 4.6}], Text["2", {0.4, 4.6}], Text["1", {0.5, 4.6}], Text["0", {0.7, 4.6}]}]]
U2n+2
               n=3 \ 2 \ 1
 4
F = (2 / Pi) ^ (1 / 2) Sin[m x]
      \frac{2}{\pi} \; \operatorname{Sin}[\mathfrak{m} \, \mathbf{x}]
data1 = Table[Integrate[
            \left( \left( 2 \left( n+1 \right) / \operatorname{Pi} \left( n+2 \right) \right) ^{\circ} 0.5 \right) \left( \operatorname{Sin} [2 \, x \left( n+1 \right) ] / \left( 2 \left( n+1 \right) \, \operatorname{Sin} [x] \right) - \operatorname{Cos} [x \left( 2 \, n+3 \right) ] \right) \\ \left( 2 / \operatorname{Pi} \right) ^{\circ} \left( 1 / 2 \right) \operatorname{Sin} [2 \, x] , \\ \left\{ x, \, 0.01, \, \operatorname{Pi} \right\} \right] , \\ \left\{ n, \, 0, \, 6 \right\} \right] 
\{1.92067, 0.712866, 0.448064, 0.328663, 0.260095, 0.215423, 0.183948\}
A2n1 = ListPlot[data1, PlotStyle \rightarrow {PointSize[0.02]}, AxesLabel \rightarrow {"n+1", "A2n+1"}]
A2n+1
1.5
1.0
Show[A2n1, Graphics[{Line[{{1, 0}, {1, 1.92}}], Line[{{2, 0}, {2, 0.71}}], Line[{{3, 0}, {3, 0.45}}],
          Line[{{4,0}, {4,0.33}}], Line[{{5,0}, {5,0.26}}], Line[{{6,0}, {6,0.22}}], Line[{{7,0}, {7,0.18}}]]]]
A2n+1
1.5
1.0
0.5
Integrate[(2 / Pi) (Sin[m x]) ^ 2, {x, 0, Pi}]
          Sin[2m\pi]
                    2 m \pi
data2 = Table[Integrate[
            ((2 (n+1) / Pi (n+2))^{0.5}) (Sin[2x (n+1)] / (2 (n+1) Sin[x]) - Cos[x (2n+3)]) (2 / Pi)^{(1/2)} Sin[4x], \{x, 0.01, Pi\}], \{n, 0, 6\}]
\{-0.548764, 2.69305, 1.11337, 0.738229, 0.559824, 0.453375, 0.381979\}
data3 = Table[Integrate[
            \left( \left( 2\,\left( n+1 \right) \,/\, \text{Pi}\,\left( n+2 \right) \right) \,{}^{\wedge}\, 0.5 \right) \, \left( \, \text{Sin} \left[ 2\,x\,\left( n+1 \right) \,\right] \,/\, \left( 2\,\left( n+1 \right) \,\text{Sin} \left[ x \right] \right) \,-\, \text{Cos} \left[ x\,\left( 2\,n+3 \right) \,\right] \right) \, \left( \, 2\,/\, \text{Pi} \right) \,{}^{\wedge}\, \left( \, 1\,/\,\, 2 \right) \,\, \text{Sin} \left[ 6\,x \right] \,,\,\, \left\{ x,\,\, 0.01 \,,\,\, \text{Pi} \right\} \right] \,,\,\, \left\{ n,\,\, 0\,,\,\, 6\,\right\} \right] \,,\,\, \left\{ \, n,\,\, 0\,,\,\, 6\,\right\} \,,\,\, \left\{ 
\{-0.0914608, -1.0873, 3.41636, 1.43904, 0.972392, 0.748578, 0.613539\}
data = ListPlot[{data1, data2, data3}, PlotStyle <math>\rightarrow Thickness[0.006], AxesLabel \rightarrow {"n+1", "A2n+1"}, PlotJoined \rightarrow True]
A2n+1
 2
Show[data,
  F(x)=(2/Pi)^{\wedge}(1/2)Sin[m\ x]
                                                                                      m=6
F = (2 / Pi) ^ (1 / 2) Sin[m x]
Integrate[F^2, {x, 0, Pi}]
F1 = (x (Pi - x))^{(0.1)} (2/Pi)^{(1/2)} Sin[2x]
    \frac{2}{\pi} ((\pi - \mathbf{x}) \mathbf{x})^{0.1} \sin[2 \mathbf{x}]
Integrate[F1^2, {x, 0, Pi}]
1.11339
Plot[F1, {x, 0, Pi}]
 0.5
-0.5
d = Dt[F1, x]
2\sqrt{\frac{2}{\pi}} ((\pi - \mathbf{x}) \mathbf{x})^{0.1} \cos[2\mathbf{x}] + \frac{0.0797885 (\pi - 2\mathbf{x}) \sin[2\mathbf{x}]}{((\pi - \mathbf{x}) \mathbf{x})^{0.9}}
Plot[d, {x, 0, Pi}]
 1.0
 0.5
-0.5
-1.0
FF1 = Integrate[F1 Sin[Qx], {x, 0, Pi}]
ConditionalExpression \left[15.5328\,\text{HypergeometricPFQ}\left[\left\{1.05,\,0.55\right\},\,\left\{1.1,\,0.6,\,\frac{1}{2}\right\},\,-\frac{1}{4}\,\pi^2\,\left(-2+Q\right)^2\right]
    15.5328 HypergeometricPFQ \left[ \{1.05, 0.55\}, \left\{ 1.1, 0.6, \frac{1}{2} \right\}, -\frac{1}{4} \pi^2 (2+Q)^2 \right]
     14.2384 \; \text{HypergeometricPFQ} \left[ \left. \left\{ 1.55 \,,\, 1.05 \right\} \,,\, \left\{ 1.6 \,,\, 1.1 \,,\, \frac{1}{2} \right\} \,,\, -\frac{1}{4} \; \pi^2 \; \left( -2 + \mathsf{Q} \right)^{\, 2} \right] \,+\, \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2} \left[ \left( -2 + \mathsf{Q} \right)^{\, 2} \right] + \left( -2 + \mathsf{Q} \right)^{\, 2}
  14.2384 \; \text{HypergeometricPFQ} \left[ \left. \{ 1.55, \, 1.05 \right\}, \, \left\{ 1.6, \, 1.1, \, \frac{1}{2} \right\}, \, -\frac{1}{4} \, \pi^2 \, \left( 2 + \mathsf{Q} \right)^{\, 2} \right], \, \mathsf{Q} \in \mathsf{Reals} \right]
Plot[FF1, {Q, 0, 8}, PlotRange \rightarrow {-0.5, 1.5}, AxesLabel \rightarrow {"Q", "FF(Q)"}]
  FF(Q)
 1.5 ┌
 0.5
Plot[Integrate[(2/Pi)^(1/2)Sin[2x]Sin[Qx], \{x, 0, Pi\}], \{Q, 0, 8\}, PlotRange \rightarrow \{-0.5, 1.5\}]
  1.0
```

0.5

 $((2(n+1)/Pi(n+2))^0.5)(Sin[2x(n+1)]/(2(n+1)Sin[x])-Cos[x(2n+3)])$

 $\left(-\cos[(3+2\,n)\,\,x] + \frac{\csc[x]\,\sin[2\,(1+n)\,\,x]}{2\,(1+n)}\right)$