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In[48]:= Array[c, 100];
Array[b, 100];
n = 10;
y[x_] = ((Csc[Sqrt[2]] Sin[Sqrt[2] x]) - x) / 2;
p11 = Plot[y[x], {x, 0, 1}, PlotRange -> {0, 0.1}, AxesLabel -> {"x", "y(x)"}]
k = 1;
While[(k < n + 1),
  c[k] = Integrate[x Sqrt[2] Sin[k Pi x], {x, 0, 1}];
  lk = (k Pi) ^ 2;
  b[k] = c[k] / (lk - 2);
  k = k + 1];
s1[x_] = Sum[c[k] Sqrt[2] Sin[k Pi x], {k, 1, n}];
d1[x_] = Abs[s1[x] - x];
Plot[d1[x], {x, 0, 1}, PlotRange -> {0, 1}, AxesLabel -> {"x", "d1(x)"}]
s2[x_] = Sum[b[k] Sqrt[2] Sin[k Pi x], {k, 1, n}];
p12 = Plot[s2[x], {x, 0, 1}, PlotRange -> {0, 0.1}, PlotStyle -> Dashing[{0.05, 0.05}]]
Show[p11, p12]
Plot[Abs[y[x] - s2[x]], {x, 0, 1}]

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