```
(* ------------------------------------------------ *)
(*   SL2.nb   de2  Math 371 SL p 6b [Richard Hall] *)
(* ------------------------------------------------ *)
```

In[35]:=
```
(* solve k tan k = 1 near (n-1)pi  *)
```

In[36]:=
```
kn[n_] := Last[Last[ FindRoot[k Tan[k] == 1, {k, (n - 1) Pi + 0.1}]]]
```

In[37]:=
```
kn[1]
```

Out[37]=
```
0.860334
```

In[38]:=
```
(* array of roots  *)
```

In[39]:=
```
vkn = Map[kn, {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20}]
```

Out[39]=
```
{0.860334, 3.42562, 6.4373, 9.52933, 12.6453, 15.7713, 18.9024, 22.0365, 25.1724, 28.3096,
 31.4477, 34.5864, 37.7256, 40.8652, 44.005, 47.1451, 50.2854, 53.4258, 56.5663, 59.707}
```

In[40]:=
```
vkn[[3]]
```

Out[40]=
```
6.4373
```

In[41]:=
```
(* Fourier coefficients for f(x) = x on [0,1]  *)
```

In[42]:=
```
cn[k_] := 2 * (2 * Cos[k] - 1) / (((1 + Sin[k]^2)) * k * k)
```

In[43]:=
```
cn[vkn[[3]]]
```

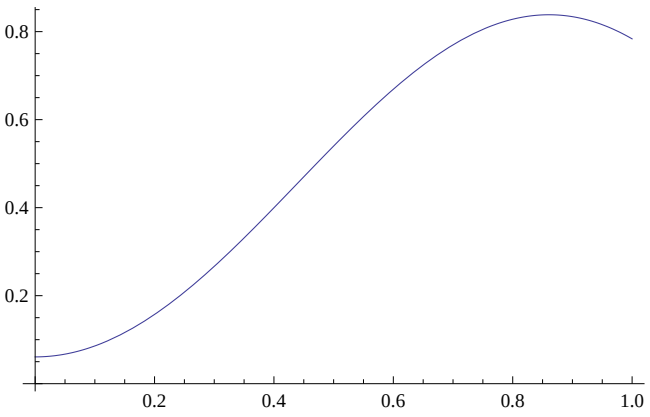
Out[43]=
```
0.0460352
```

In[44]:=
```
(* Fourier series with m terms  *)
```

In[45]:=
```
f[x_, m_] := Sum[cn[vkn[[n]]] * Cos[vkn[[n]] * x], {n, m}]
```

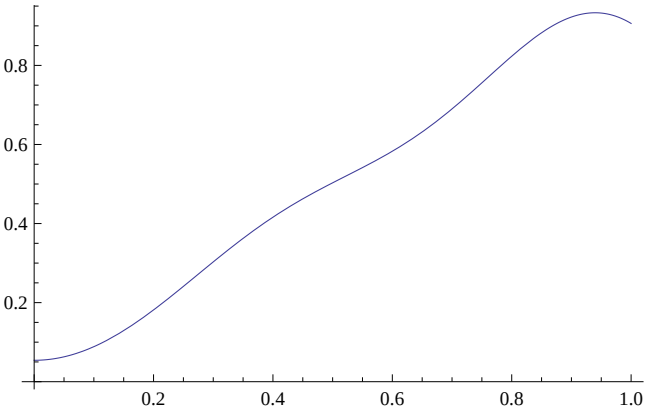
In[46]:=
```
Plot[f[x, 2], {x, 0, 1}]
```

Out[46]=



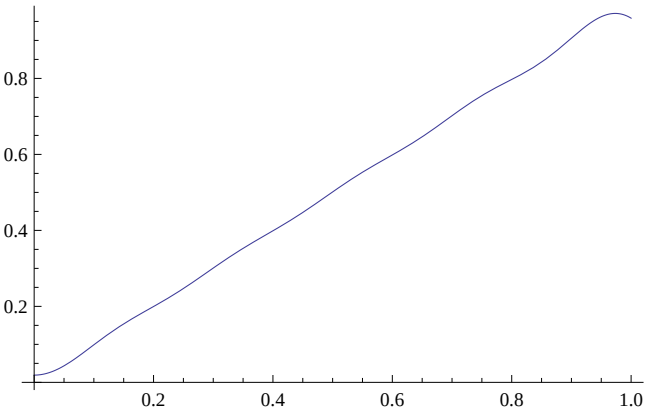
In[47]:=
```
Plot[f[x, 5], {x, 0, 1}]
```

Out[47]=



In[48]:=
```
Plot[f[x, 10], {x, 0, 1}]
```

Out[48]=



In[49]:=
```
Plot[f[x, 20], {x, 0, 1}]
```

Out[49]=