Respuestas correctas de los ejercicios del capítulo 1.

Preguntas de comprensión

1. d,
2. a,
3. c,
4. b,
5. c,
6. c,
7. d,
8. d,
9. b,
10. a,
11. b,
12. d,
13. b,
14. b,
15. c,
16. a,
17. b,
18. b,
19. a,
20. d

Ejercicios introductorios

1. c,
2. d,
3. b,
4. b,
5. c

Ejercicios de programación de métodos numéricos

1.

```
def fact(n):
        if n==1: return 1
        else: return n*fact(n-1)
```

2.

```
def seno(x,n):
        if n==0: return x
        else: return seno(x,n-1)+((-1)**n)*(x**(2*n+1))/fact(2*n+1)
```

3.

```
def pifin1(n):
        if n==0: return 8/3
        else: return pifin1(n-1)*(2*n+2)**2/((2*n+1)*(2*n+3))
```

4.

```
def pifin2(n):
        if n==0: return 3
        else: return pifin2(n-1)+coef(n)*6/(2**(2*n+1))/(2*n+1)

def coef(n):
        if n==1: return 1/2
        else: return coef(n-1)*(2*n-1)/(2*n)
```

5.

```
mattimes[a_, b_] := Module[{i, j, k},
  If[Length[a[[1]]] != Length[b],
   Print["Estas matrices no se pueden multiplicar."],
   Table[Sum[a[[i, j]] b[[j, k]], {j, 1, Length[b]}],
    {i, 1, Length[a]}, {k, 1, Length[b[[1]]]}]]]
```

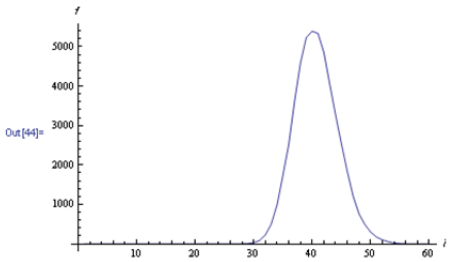
6.

```
rnd[n_] := Module[{suma, cont, a},
  suma = 0;
  cont = 0;
  While[a ≤ n,
   a = a + Random[];
   cont++];
  cont]
```

7.

```
repeat[m_, n_] := Module[{i, a, veces},
  max = 0;
  For[i = 1, i ≤ m, i++,
   veces = rnd[n];
   If[veces > max, max = veces];
   If[a[veces] > 0, a[veces]++, , a[veces] = 1];
   a[veces]];
  estadistica = Table[If[a[i] > 0, {i, a[i]}, , {i, 0}], {i, 1, max}];
  ListPlot[estadistica, Joined → True, AxesLabel → {"i", "f"}]]
```

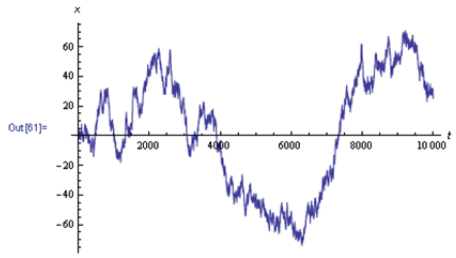
```
In[25]:= rnd[5]
In[44]:= repeat[50 000, 20]
```



8.

```
camina[n_] := Module[{},
  x = 0;
  t = 0;
  lista = {{t, x}};
  For[t = 1, t ≤ n, t++,
   x = x + (2 Random[Integer, {0, 1}] - 1);
   lista = Append[lista, {t, x}]];
  ListPlot[lista, Joined → True, AxesLabel → {"t", "x"}]]
```

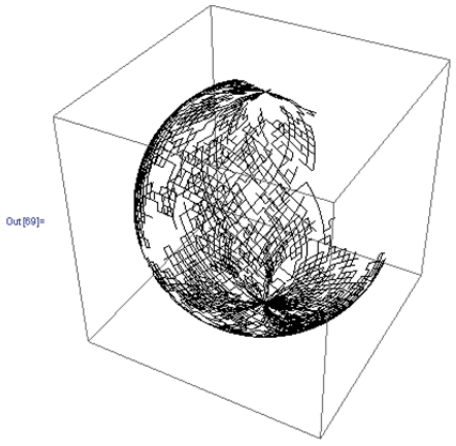
```
In[81]:= camina[10 000]
```



9.

```
caminaesfera[n_, d_] := Module[{},
  u = 0;
  v = 0;
  lista = {{Sin[u] Cos[v], Sin[u] Sin[v], Cos[u]}};
  For[t = 1, t ≤ n, t++,
   u = u + d (2 Random[Integer, {0, 1}] - 1);
   v = v + d (2 Random[Integer, {0, 1}] - 1);
   lista = Append[lista, {Sin[u] Cos[v], Sin[u] Sin[v], Cos[u]}]];
  Graphics3D[Line[lista]]]
```

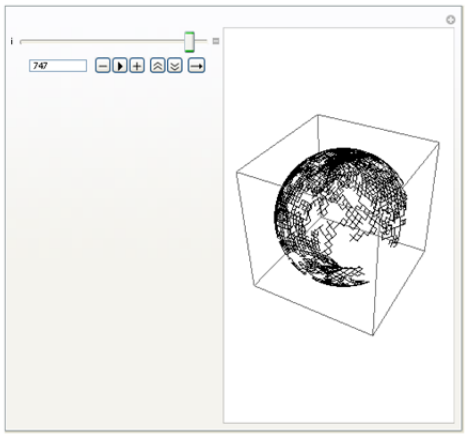
```
In[69]:= caminaesfera[10 000, .05]
```



10.

```
animaesfera[n_, d_] := Module[{},
  u = 0;
  v = 0;
  lista = {{Sin[u] Cos[v], Sin[u] Sin[v], Cos[u]}};
  For[t = 1, t ≤ n, t++,
   u = u + d (2 Random[Integer, {0, 1}] - 1);
   v = v + d (2 Random[Integer, {0, 1}] - 1);
   lista = Append[lista, {Sin[u] Cos[v], Sin[u] Sin[v], Cos[u]}]];
  Manipulate[Graphics3D[Line[Drop[lista, i]],
    PlotRange → {{-1, 1}, {-1, 1}, {-1, 1}}],
   {i, Length[lista] - 1, 0, -1}]]
```

```
In[77]:= animaesfera[10 000, .05]
```

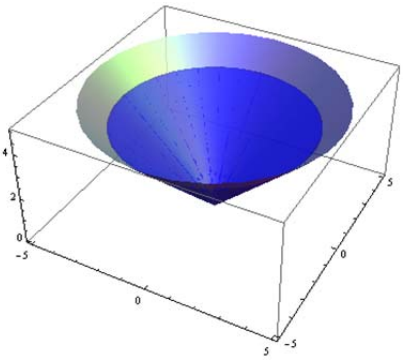



```
Out[77]=
```

Ejercicios aplicados

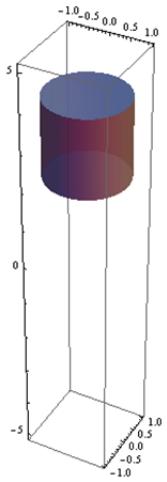
1.

```
For[zf = 4, zf ≥ 0, zf = zf - 0.1,
 g1 = ParametricPlot3D[{r Cos[u], r Sin[u], r}, {r, 0, 5},
   {u, 0, 2 Pi}, Mesh → None,
   PlotStyle → Directive[Gray, Specularity[White, 20], Opacity[0.8]],
   ExclusionsStyle → {None, Red}, BoxRatios → Automatic];
 g2 = RegionPlot3D[x^2 + y^2 < z^2 && z > 0 && z < zf, {x, -5, 5},
   {y, -5, 5}, {z, 0, 5}, PlotStyle → Directive[Blue, Opacity[0.5]],
   Mesh → None, PlotPoints → 50, BoxRatios → Automatic];
 Print[Show[{g1, g2}]]]
```



2.

```
w = 3;
A = 4;
For[t = 0, t ≤ 2 Pi / w, t = t + (2 Pi / w) / 20,
 zf = A * Sin[w * t];
 g1 = ParametricPlot3D[{Cos[u], Sin[u], z + zf}, {z, -1, 1},
    {u, 0, 2 Pi}, Mesh → None,
    PlotStyle → Directive[Gray, Specularity[White, 20], Opacity[0.8]],
    ExclusionsStyle → {None, Red}, BoxRatios → Automatic];
 g2 = ParametricPlot3D[{r Cos[u], r Sin[u], zf + 1}, {r, 0, 1},
    {u, 0, 2 Pi}, Mesh → None,
    PlotStyle → Directive[Gray, Specularity[White, 20], Opacity[0.8]],
    ExclusionsStyle → {None, Red}, BoxRatios → Automatic];
 g3 = ParametricPlot3D[{r Cos[u], r Sin[u], zf - 1}, {r, 0, 1},
    {u, 0, 2 Pi}, Mesh → None,
    PlotStyle → Directive[Gray, Specularity[White, 20], Opacity[0.8]],
    ExclusionsStyle → {None, Red}, BoxRatios → Automatic];
 Print[Show[{g1, g2, g3}, PlotRange → {{-1, 1}, {-1, 1}, {-A - 1, A + 1}}]]]
```



3.

```
wp = 10;
ws = 20;
rp = 20;
rs = 6;
For[t = 0, t ≤ 2 Pi / wp, t = t + (2 Pi / wp) / 40,
 zf = A * Sin[w * t];
 g1 = Graphics3D[{Red, Sphere[{0, 0, 0}, 4]}];
 g2 =
  Graphics3D[{Blue, Sphere[{rp * Cos[wp * t], rp * Sin[wp * t], 0}, 2]}];
 g3 =
  Graphics3D[
   {Gray, Sphere[{rp * Cos[wp * t] + rs * Cos[ws * t],
      rp * Sin[wp * t] + rs * Sin[ws * t], 0}, 1]}];
 Print[Show[{g1, g2, g3},
   PlotRange → {{-(rp + rs + 4), (rp + rs + 4)},
     {-(rp + rs + 4), (rp + rs + 4)}, {-4, 4}}]]]
```