Exercises 4.5

1. Evaluate the integral∫10x√1+x2dxusing the Trapezoid and Simpson'srules with 4 subdivisions of the integration limits. Later use the Gaussquadrature rule with 4 integration points. Compare the results.

```
clear all
clc
```

Analítico

```
syms x
xmin = 0; xmax = 1;
eqs = x/(sqrt(1+x^2));
valor_analitico = vpa(int(eqs, xmin, xmax),4)
```

valor_analitico = 0.4142

Trapezoid

```
nt = 4;
at = linspace (xmin, xmax, nt+1);
yt = subs (eqs, x, at);
ht = at(2) - at(1);
valor_numericot = ht * (yt(1)/2 + sum(yt(2:nt)) + yt(nt+1)/2);
vpa(valor_numericot, 4)
```

ans = 0.4108

Simpson's

```
ns = 4;
as = linspace (xmin, xmax, ns*2+1);
asp = as(linspace(2, ns*2, ns));
asi = as(linspace(1, ns*2-1, ns));
ys = subs (eqs, x, as);
ysi= subs (eqs, x, asi);
ysp= subs (eqs, x, asp);
hs = as(2) - as(1);
valor_numericos = hs/3 * (ys(1) + 4*sum(ysp) + 2*sum(ysi(2:ns)) + ys(ns*2+1));
vpa(valor_numericos, 4)
```

ans = 0.4142

Gauss

```
quadrature_4  = [
    -0.33998104358485626480266583  0.65214515486254614262693611
     0.33998104358485626480266583  0.65214515486254614262693611
    -0.86113631159405257522394649  0.34785484513745385737306394
     0.86113631159405257522394649  0.34785484513745385737306394];
valor_numericog = 0.0;
for i = 1:4
    f = @(t) ((xmax - xmin)*t/2 + (xmax - xmin)/2);
    eqs = @(x) x/(sqrt(1+x^2));
    t = quadrature_4(i, 1);
```

```
    w = quadrature_4(i, 2);
    y = eqs(f(t));
    valor_numericog = w * y * (xmax - xmin)/2 + valor_numericog;
end
vpa(valor_numericog, 4)
```

ans = 0.4142