```
function [x,y,z] = density(z)

    mol = 0.029;
    R = 8.314;
    h = z/1000;                  % h, altitude in km

    if h <= 11                  % pressure and temperature values by altitude
        T = 288.15 - 6.5*h;
        P = 101325*((288.15/(288.15-6.5*h))^(34.1632/-6.5));
    elseif 11 < h && h <= 20
        T = 216.65;
        P = 22632.06*exp(-34.1632*(h-11)/216.65);
    elseif 20 < h && h <= 32
        T = 196.65 + 0.001*z;
        P = 5474.889 * ((216.65/(216.65+(h-20)))^(34.1632));
    elseif 32 < h && h <= 47
        T = 139.05 + 2.8*h;
        P = 868.0187 * ((228.65/(228.65+2.8*(h-32)))^(34.1632/2.8));
    elseif 47 < h && h <= 51
        T = 270.65;
        P = 110.9063 * exp(-34.1632*(h-47)/270.65);
    elseif 51 < h && h <= 71
        T = 413.45 - 2.8*h;
        P = 66.93887*((270.65/(270.65-2.8*(h-51)))^(34.1632/-2.8));
    else %71 < h && h <= 86
        T = 356.65 - 2.0*h;
        P = 3.956420*((214.65/(214.65-2*(h-71)))^(34.1632/-2));
    end

    rho = (mol*P)/(R*T);

    if 86 < h && h <= 91
        P = exp(-4.22012E-08*h^5 + 2.13489E-05*h^4 - 4.26388E-03*h^3 +
0.421404*h^2 - 20.8270*h + 416.225);
        rho = exp(7.5691E-08*h^5 - 3.76113E-05*h^4 + 0.0074765*h^3 -
0.743012*h^2 + 36.7280*h - 729.346 );
        T = 186.8673;
    elseif 91 < h && h <= 100
        P = exp(-4.22012E-08*h^5 + 2.13489E-05*h^4 - 4.26388E-03*h^3 +
0.421404*h^2 - 20.8270*h + 416.225);
        rho = exp(7.5691E-08*h^5 - 3.76113E-05*h^4 + 0.0074765*h^3 -
0.743012*h^2 + 36.7280*h - 729.346 );
        T = 263.1905-76.3232*sqrt(1 - ((h-91)/-19.9429)^2);
    elseif 100 < h && h <= 110
        P = exp(-4.22012E-08*h^5 + 2.13489E-05*h^4 - 4.26388E-03*h^3 +
0.421404*h^2 - 20.8270*h + 416.225);
        rho = exp(7.5691E-08*h^5 - 3.76113E-05*h^4 + 0.0074765*h^3 -
0.743012*h^2 + 36.7280*h - 729.346 );
        T = 263.1905-76.3232*sqrt(1 - ((h-91)/-19.9429)^2);
    elseif 110 < h && h <= 120
        rho = exp(-8.854164E-05*h^3 + 0.03373254*h^2 - 4.390837*h +
176.5294);
        P = 0;
        T = 240 + 12*(h-110);
    elseif 120 < h && h <= 150
        P = 0;
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```
        rho = exp(3.661771E-07*h^4 - 2.154344E-04*h^3 + 0.04809214*h^2 -
4.884744*h + 172.3597);
        T = 1000 - 640*exp(-0.01875*(h-120)*(6356.766 + 120)/(6356.766+h));
    elseif 150 < h && h <= 200
        P = 0;
        rho = 02.0763e-09;
        T = 1000 - 640*exp(-0.01875*(h-120)*(6356.766 + 120)/(6356.766+h));
    end

    x = rho;
    y = T;
    z = P;
end
```