```
(*以下这是《曾-钱量子力学习题剖析》的5.2题的推导*)
(*清除所有变量*)ClearAll[r, α, ρ, u, v, ħ, μ, λ, l, β, Eval]
                  清除全部
(*假设 α 和 β 不等于0*)
(*α=2;
β=(1-α)/(2 α);*)

Assuming[{α ≠ 0, ρ ≠ 0}, r = ρ^(1 / α)];
假定
Assuming[{β ≠ 0, ρ ≠ 0}, u = ρ^β v[ρ]];
假定
(*计算 dr/dρ 和 dudr*)
drdρ = D[r, ρ];
       偏导
dudr = D[u, ρ] / drdρ;
       偏导

(*计算二阶导数*)
ddudrr = D[dudr, ρ] / drdρ;
         偏导
(*定义径向方程*)
radialEquation =
  (ħ^2 / (2 * μ)) * ddudrr + (Eval - λ * r^2 - (l * (l + 1) * (ħ^2) / (2 * μ * r^2))) * u;

rCoefficient = Coefficient[radialEquation, v''[ρ]];
               系数
eq = Simplify[radialEquation ħ^2 / (rCoefficient 2 μ)];
     化简

vCoeff = Coefficient[eq, v[ρ]]
         系数
```

Out[•]=

$$\frac{2\,\text{Eval}\,\mu\,\rho^{2/\alpha} - 2\,\lambda\,\mu\,\rho^{3/\alpha} - \left(1 + l^2 + \alpha\,\beta\,(1 - \alpha\,\beta)\right)\,\hbar^2}{2\,\alpha^2\,\mu\,\rho^2}$$

In[•]:= (*经分析α只能取1或者2才能满足径向方程的一般形式，其中分别对应各向同性谐振子势和库伦势*)

In[•]:=
```
(*以下是以下这是《曾-钱量子力学习题剖析》的5.3题的推导*)
ClearAll[r, α, ρ, u, ν, ħ, μ, λ, l, β, Eval]
清除全部
Assuming[{α ≠ 0, ρ ≠ 0}, r = ρ^(1 / α)];
假定
Assuming[{β ≠ 0, ρ ≠ 0}, u = ρ^β v[ρ]];
假定
β = (1 - α) / (2 α);


(*计算 dr/dρ 和 dudr*)
drdρ = D[r, ρ];
       偏导
dudr = D[u, ρ] / drdρ;
       偏导

(*计算二阶导数*)
ddudrr = D[dudr, ρ] / drdρ;
         偏导
(*定义径向方程*)
Assuming[ν ≠ 0, radialEquation =
假定
    (ħ^2 / (2 * μ)) * ddudrr + (Eval - λ * r^ν - (l * (l + 1) * (ħ^2) / (2 * μ * r^2))) * u];

rCoefficient = Coefficient[radialEquation, v''[ρ]];
               系数

eq = Simplify[radialEquation ħ^2 / (rCoefficient 2 μ)];
     化简

vCoeff = Coefficient[eq, v[ρ]]
         系数
```

Out[•]=
$$\frac{8\,\text{Eval}\,\mu\,\rho^{2/\alpha} - 8\,\lambda\,\mu\,\rho^{2/\alpha}\left(\rho^{\frac{1}{\alpha}}\right)^{\nu} + \left(-1 - 4\,l - 4\,l^2 + \alpha^2\right)\hbar^2}{8\,\alpha^2\,\mu\,\rho^2}$$

In[•]:=
```
2 / α + ν / α - 2 == 0;
α = (ν + 2) / 2;
νPrim = 2 / α - 2
```

Out[•]=
$$-2 + \frac{4}{2 + \nu}$$