```
> restart;
> with(PDEtools):with(linalg):with(LinearAlgebra):with(plots):alias
  (sigma=sigma(z),phi=phi(t),psi=psi(t)):d:=-1/2:epsilon[3]:=1;
```

$$\varepsilon_3 := 1 \tag{1}$$

```
> k[0]:=-1/4*(2*alpha+beta+n);k[1]:=1/4*(3*n+2*alpha-beta);k[2]:=
  1/4*(3*beta-n-2*alpha);k[3]:= 1/4*(2*alpha-beta-n);
```

$$k_0 := -\frac{1}{2}\alpha - \frac{1}{4}\beta - \frac{1}{4}n$$

$$k_1 := \frac{3}{4}n + \frac{1}{2}\alpha - \frac{1}{4}\beta$$

$$k_2 := \frac{3}{4}\beta - \frac{1}{4}n - \frac{1}{2}\alpha$$

$$k_3 := \frac{1}{2}\alpha - \frac{1}{4}\beta - \frac{1}{4}n \tag{2}$$

```
> S5:=z^2*(diff(sigma, z, z))^2-(2*(diff(sigma, z))^2-z*(diff
  (sigma, z))+sigma)^2+(4*(diff(sigma, z)+k[0]))*(diff(sigma, z)+k
  [1])*(diff(sigma, z)+k[2])*(diff(sigma, z)+k[3]);
```

$$S5 := z^2\left(\frac{\partial^2}{\partial z^2}\sigma\right)^2 - \left(2\left(\frac{\partial}{\partial z}\sigma\right)^2 - z\left(\frac{\partial}{\partial z}\sigma\right) + \sigma\right)^2 + 4\left(\frac{\partial}{\partial z}\sigma - \frac{1}{2}\alpha - \frac{1}{4}\beta - \frac{1}{4}n\right)\left(\frac{\partial}{\partial z}\sigma + \frac{3}{4}n + \frac{1}{2}\alpha - \frac{1}{4}\beta\right)\left(\frac{\partial}{\partial z}\sigma + \frac{3}{4}\beta - \frac{1}{4}n - \frac{1}{2}\alpha\right)\left(\frac{\partial}{\partial z}\sigma + \frac{1}{2}\alpha - \frac{1}{4}\beta - \frac{1}{4}n\right) \tag{3}$$

```
> sigma:=factor(A*z+B);
```

$$\sigma := A z + B \tag{4}$$

```
> collect(simplify(S5),z,factor);
```

$$-\frac{3}{2}A^2\beta^2 - \frac{3}{2}A^2n^2 - 2A^2\alpha^2 + \frac{1}{2}An^3 + \frac{1}{2}A\beta^3 + \frac{1}{8}\alpha^2n^2 - \frac{1}{8}\alpha n^3 + \frac{1}{2}\alpha^3 n - \frac{1}{2}\alpha^3\beta + \frac{1}{8}\alpha^2\beta^2 + \frac{1}{16}\beta^3 n + \frac{7}{32}\beta^2n^2 + \frac{1}{16}\beta n^3 + \frac{1}{8}\beta^3\alpha - 4A^2B + 2A^2\beta\alpha + A^2\beta n - 2A^2 n\alpha + An^2\alpha - \frac{1}{2}An^2\beta - A\beta^2\alpha - \frac{1}{2}A\beta^2 n - \frac{1}{8}\alpha n^2\beta - \frac{3}{4}\alpha^2 n\beta + \frac{1}{8}\beta^2 n\alpha + \frac{1}{4}\alpha^4 - \frac{3}{64}\beta^4 - \frac{3}{64}n^4 - B^2 \tag{5}$$

```
> #solve(%,A);
> w=factor(-z/(-b+a-n)+(1+2*a-n-3*b)/(-b+a-n));
```

$$w = \frac{-z+1+2a-n-3b}{-b+a-n} \tag{6}$$

```
> w=factor(z/(a+n)+(3*n+2*a+1-b)/(a+n));
```

$$w = \frac{z+3n+2a+1-b}{a+n} \tag{7}$$

```
> w=factor(-z/(a+n)+(n+b+2*a-1)/(a+n));
```

$$w = \frac{-z+n+b+2a-1}{a+n} \tag{8}$$

```
> #H:={A=1/2*(b-a+n)^2,B=-1/2*a^2,C=1+n-b};
> #H:={A=(a+n)^2/2,B=-(b-a)^2/2,C=(b-n-1)};
> #solve(4*a+2*R*n-2*b-2-6*n+2*R*b-2*R*a,R);
```