```
> restart
> EcuaEnDerPar := diff(z(x, y), x$2) + 8·diff(z(x, y), y) = z(x, y)
```

$$EcuaEnDerPar := \frac{\partial^2}{\partial x^2} z(x, y) + 8 \left(\frac{\partial}{\partial y} z(x, y) \right) = z(x, y) \tag{1}$$

```
> SolGralUno := z(x, y) = (_C1·x + _C2)·exp(y/8)
```

$$SolGralUno := z(x, y) = (\_C1\, x + \_C2)\, e^{\frac{1}{8} y} \tag{2}$$

```
> ComprobarUno := simplify(eval(subs(z(x, y) = rhs(SolGralUno), lhs(EcuaEnDerPar)
      − rhs(EcuaEnDerPar) = 0)))
```

$$ComprobarUno := 0 = 0 \tag{3}$$

```
> SolGralDos := z(x, y) = (_C1·exp(sqrt(8)·beta·x) + _C2·exp(−sqrt(8)·beta·x))·exp((1/8
      − β^2)y)
```

$$SolGralDos := z(x, y) = \left(\_C1\, e^{2\sqrt{2}\,\beta x} + \_C2\, e^{-2\sqrt{2}\,\beta x}\right) e^{\left(\frac{1}{8} - \beta^2\right) y} \tag{4}$$

```
> ComprobarDos := simplify(eval(subs(z(x, y) = rhs(SolGralDos), lhs(EcuaEnDerPar)
      − rhs(EcuaEnDerPar) = 0)))
```

$$ComprobarDos := 0 = 0 \tag{5}$$

```
> SolGralTres := z(x, y) = (_C1·cos(sqrt(8)·beta·x) + _C2·sin(sqrt(8)·beta·x))·exp((1/8
      + β^2)y)
```

$$SolGralTres := z(x, y) = \left(\_C1 \cos\left(2\sqrt{2}\,\beta\, x\right) + \_C2 \sin\left(2\sqrt{2}\,\beta\, x\right)\right) e^{\left(\frac{1}{8} + \beta^2\right) y} \tag{6}$$

```
> ComprobarTres := simplify(eval(subs(z(x, y) = rhs(SolGralTres), lhs(EcuaEnDerPar)
      − rhs(EcuaEnDerPar) = 0)))
```

$$ComprobarTres := 0 = 0 \tag{7}$$

```
> with(PDEtools)
```

[CanonicalCoordinates, ChangeSymmetry, CharacteristicQ, CharacteristicQInvariants, ConservedCurrentTest, ConservedCurrents, ConsistencyTest, D_Dx, DeterminingPDE, Eta_k, Euler, FromJet, FunctionFieldSolutions, InfinitesimalGenerator, Infinitesimals, IntegratingFactorTest, IntegratingFactors, InvariantEquation, InvariantSolutions, InvariantTransformation, Invariants, Laplace, Library, PDEplot, PolynomialSolutions, ReducedForm, SimilaritySolutions, SimilarityTransformation, Solve, SymmetryCommutator, SymmetryGauge, SymmetrySolutions, SymmetryTest, SymmetryTransformation, TWSolutions, ToJet, build, casesplit, charstrip, dchange, dcoeffs, declare, diff_table, difforder, dpolyform, dsubs, mapde, separability, splitstrip, splitsys, undeclare] (8)

```
> SolGral := build(pdsolve(EcuaEnDerPar))
```

$$SolGral := z(x, y) = e^{\sqrt{\_c_1}\, x}\, \_C3\, e^{-\frac{1}{8} y \_c_1}\, e^{\frac{1}{8} y}\, \_C1 + \frac{\_C3\, e^{-\frac{1}{8} y \_c_1}\, e^{\frac{1}{8} y}\, \_C2}{e^{\sqrt{\_c_1}\, x}} \tag{9}$$

> $EcuaSeparada := \frac{(diff(F(x), x\$2) - F(x))}{-8 \cdot F(x)} = \frac{diff(G(y), y)}{G(y)}$

$$EcuaSeparada := -\frac{1}{8} \frac{\frac{d^2}{dx^2} F(x) - F(x)}{F(x)} = \frac{\frac{d}{dy} G(y)}{G(y)} \quad \textbf{(10)}$$

> $EcuaXalpha := lhs(EcuaSeparada) = \text{alpha}$

$$EcuaXalpha := -\frac{1}{8} \frac{\frac{d^2}{dx^2} F(x) - F(x)}{F(x)} = \alpha \quad \textbf{(11)}$$

> $EcuaYalpha := rhs(EcuaSeparada) = \text{alpha}$

$$EcuaYalpha := \frac{\frac{d}{dy} G(y)}{G(y)} = \alpha \quad \textbf{(12)}$$

> $SolXcero := dsolve(subs(\text{alpha} = 0, EcuaXalpha))$

$$SolXcero := F(x) = \_C1\, e^{x} + \_C2\, e^{-x} \quad \textbf{(13)}$$

> $SolYcero := dsolve(subs(\text{alpha} = 0, EcuaYalpha))$

$$SolYcero := G(y) = \_C1 \quad \textbf{(14)}$$

> $SolGralCero := z(x, y) = rhs(SolXcero) \cdot (subs(\_C1 = 1, rhs(SolYcero)))$

$$SolGralCero := z(x, y) = \_C1\, e^{x} + \_C2\, e^{-x} \quad \textbf{(15)}$$

> $ComprobarCuatro := simplify(eval(subs(z(x, y) = rhs(SolGralCero), lhs(EcuaEnDerPar) - rhs(EcuaEnDerPar) = 0)))$

$$ComprobarCuatro := 0 = 0 \quad \textbf{(16)}$$

> $SolXneg := dsolve\left(subs\left(\text{alpha} = -\beta^2, EcuaXalpha\right)\right)$

$$SolXneg := F(x) = \_C1 \sin\left(\sqrt{-8\beta^2 - 1}\; x\right) + \_C2 \cos\left(\sqrt{-8\beta^2 - 1}\; x\right) \quad \textbf{(17)}$$

> $SolYneg := dsolve\left(subs\left(\text{alpha} = -\beta^2, EcuaYalpha\right)\right)$

$$SolYneg := G(y) = \_C1\, e^{-\beta^2 y} \quad \textbf{(18)}$$

> $SolGralNeg := z(x, y) = rhs(SolXneg) \cdot (subs(\_C1 = 1, rhs(SolYneg)))$

$$SolGralNeg := z(x, y) = \left(\_C1 \sin\left(\sqrt{-8\beta^2 - 1}\; x\right) + \_C2 \cos\left(\sqrt{-8\beta^2 - 1}\; x\right)\right) e^{-\beta^2 y} \quad \textbf{(19)}$$

> $ComprobarCinco := simplify(eval(subs(z(x, y) = rhs(SolGralNeg), lhs(EcuaEnDerPar) - rhs(EcuaEnDerPar) = 0)))$

$$ComprobarCinco := 0 = 0 \quad \textbf{(20)}$$

> $SolXpos := dsolve\left(subs\left(\text{alpha} = \beta^2, EcuaXalpha\right)\right)$

$$SolXpos := F(x) = \_C1 \sin\left(\sqrt{8\beta^2 - 1}\; x\right) + \_C2 \cos\left(\sqrt{8\beta^2 - 1}\; x\right) \quad \textbf{(21)}$$

> $SolYpos := dsolve\left(subs\left(\text{alpha} = \beta^2, EcuaYalpha\right)\right)$

$$SolYpos := G(y) = \_C1\, e^{\beta^2 y} \quad \textbf{(22)}$$

> $SolGralPos := z(x, y) = rhs(SolXpos) \cdot (subs(\_C1 = 1, rhs(SolYpos)))$

$$SolGralPos := z(x, y) = \left(\_C1 \sin\left(\sqrt{8\beta^2 - 1}\; x\right) + \_C2 \cos\left(\sqrt{8\beta^2 - 1}\; x\right)\right) e^{\beta^2 y} \quad \textbf{(23)}$$

> $ComprobarSeis := simplify(eval(subs(z(x, y) = rhs(SolGralPos), lhs(EcuaEnDerPar)$

$- rhs(EcuaEnDerPar) = 0)))$

$$ComprobarSeis := 0 = 0 \tag{24}$$

>