```
> pde:=diff(u(x,y),x$4) + diff(u(x,y),y$4) + 2*diff(u(x,y),x$2,
  y$2);
```

$$pde := \frac{\partial^4}{\partial x^4} u(x,y) + \frac{\partial^4}{\partial y^4} u(x,y) + 2 \frac{\partial^4}{\partial x^2 \partial y^2} u(x,y)$$

```
> soln:=exp(alpha*x+beta*y);
```

$$soln := e^{\alpha x + \beta y}$$

```
> eval(pde,u(x,y)=soln);
```

$$\alpha^4 e^{\alpha x + \beta y} + \beta^4 e^{\alpha x + \beta y} + 2 \alpha^2 \beta^2 e^{\alpha x + \beta y}$$

```
> factor(%);
```

$$e^{\alpha x + \beta y} \left(\alpha^2 + \beta^2\right)^2$$

Therefore $\alpha^2 + \beta^2 = 0$; that is

```
> soln1:=eval(soln,alpha=I*beta);
```

$$soln1 := e^{I\beta x + \beta y}$$

Real solutions are

```
> evalc(soln1);
```

$$e^{\beta y} \cos(\beta x) + I e^{\beta y} \sin(\beta x)$$

that is

```
> [op(1,%),-I*op(2,%)];
```

$$\left[e^{\beta y} \cos(\beta x), e^{\beta y} \sin(\beta x)\right]$$

Check!

```
> simplify(eval(pde,u(x,y)=%[1])),simplify(eval(pde,u(x,y)=%[2]));
```

$$0, 0$$