Solve as harmonic oscillator with constant omega

```
(%i1) kill(all);
```
(%o0) *done*

```
(%i1) depends(r,t);
```
(%o1) $[r(t)]$

```
(%i2) assume(omega>0);
```
(%o2) $[\omega>0]$

```
(%i3) E: diff(r,t,2)+omega^2*r=0;
```
(%o3) $\frac{d^2}{d\,t^2}r+\omega^2 r=0$

```
(%i4) ode2(E,r,t);
```
(%o4) $r=\%k1\sin(\omega t)+\%k2\cos(\omega t)$

Solve as harmonic oscillator with general Omega(r)

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(%i5) E: diff(r,t,2)+Omega(r)^2*r=0;
```
(%o5) $\frac{d^2}{d\,t^2}r+r\,\Omega(r)^2=0$

```
(%i6) ode2(E,r,t);
```
(%o6) $\left[-\frac{\int\frac{1}{\sqrt{-\int r\,\Omega(r)^2\,dr-\%k1}}\,dr}{\sqrt{2}}=t+\%k2,\ \frac{\int\frac{1}{\sqrt{-\int r\,\Omega(r)^2\,dr-\%k1}}\,dr}{\sqrt{2}}=t+\%k2\right]$

Solve as general Diff.Eq. with r-dependent coefficients

```
(%i7) Omega(r):= -a/r^4-b*F(r)/r;
```
(%o7) $\Omega(r):=\frac{-a}{r^4}-\frac{b\,F(r)}{r}$

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(%i8) E1: ev(E);
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(%o8) $\frac{d^2}{d\,t^2}\,r + r\left(-\frac{b\,F(r)}{r}-\frac{a}{r^4}\right)^2=0$

```
(%i9) ode2(E1,r,t);
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(%o9) $\left[-\sqrt{3}\int\frac{r^3}{\sqrt{-6\,b\,r^6\int\frac{b\,r^3\,F(r)^2+2\,a\,F(r)}{r^4}dr-6\,\%k1\,r^6+a^2}}dr=t+\%k2,\sqrt{3}\int\frac{r^3}{\sqrt{-6\,b\,r^6\int\frac{b\,r^3\,F(r)^2+2\,a\,F(r)}{r^4}dr-6\,\%k1\,r^6+a^2}}dr=t+\%k2\right]$

Eq.(16)

```
(%i10) kill(Omega);
```

(%o10) *done*

```
(%i11) depends(Omega,t);
```

(%o11) [Omega(t)]

```
(%i12) E2: (Omega+diff(Omega,t)*t)^2 - %i*(diff(Omega,t,2)*t+2*diff(Omega
```

(%o12) $\left(\left(\frac{d}{d\,t}\,Omega\right)t+Omega\right)^2-\%i\left(\left(\frac{d^2}{d\,t^2}\,Omega\right)t+2\left(\frac{d}{d\,t}\,Omega\right)\right)=Omega^2$

```
(%i13) E2: ratsimp(E2);
```

(%o13) $\left(\frac{d}{d\,t}\,Omega\right)^2t^2+\left(2\,Omega\left(\frac{d}{d\,t}\,Omega\right)-\%i\left(\frac{d^2}{d\,t^2}\,Omega\right)\right)t-2\,\%i\left(\frac{d}{d\,t}\,Omega\right)+Omega^2=Omega^2$

```
(%i14) ode2(E2,Omega,t);
```

(%o14) false