```
DSolve[D[B[x], {x, 2}] + (1/(λ^2)) B[x] == 0, B[x], x]
```

$$\left\{\left\{B[x] \to C[1] \,\text{Cos}\left[\frac{x}{\lambda}\right] + C[2]\, \text{Sin}\left[\frac{x}{\lambda}\right]\right\}\right\}$$

```
DSolve[D[B[x], {x, 2}] + (1/(λ^2)) B[x] == A, B[x], x]
```

$$\left\{\left\{B[x] \to A\,\lambda^2 + C[1] \,\text{Cos}\left[\frac{x}{\lambda}\right] + C[2]\, \text{Sin}\left[\frac{x}{\lambda}\right]\right\}\right\}$$

```
(T^2) BesselJ[1, 1/(T^2)] + a BesselJ[2, 1/(T^2)]
```

$$T^2\, \text{BesselJ}\left[1, \frac{1}{T^2}\right] + A\, \text{BesselJ}\left[2, \frac{1}{T^2}\right]$$

```
Series[(T^2) BesselJ[1, 1/(T^2)] + a BesselJ[2, 1/(T^2)], {T, 0, 3}] // FullSimplify
```

$$(-1)^{\text{Floor}\left[\frac{1}{2}+\frac{\text{Arg}[T]}{\pi}\right]} e^{-\frac{i}{T^2}} \left((-1)^{\text{Floor}\left[\frac{2\,\text{Arg}[T]}{\pi}\right]} O[T]^4 + \left(-\frac{\left(\frac{1}{2}+\frac{i}{2}\right) a\, T}{\sqrt{\pi}} - \frac{\left(\frac{1}{16}-\frac{i}{16}\right)(8+15\,a)\, T^3}{\sqrt{\pi}} + O[T]^4\right) + e^{\frac{2\,i}{T^2}}\left(O[T]^4 + (-1)^{\text{Floor}\left[\frac{2\,\text{Arg}[T]}{\pi}\right]}\left(-\frac{\left(\frac{1}{2}-\frac{i}{2}\right) a\, T}{\sqrt{\pi}} - \frac{\left(\frac{1}{16}+\frac{i}{16}\right)(8+15\,a)\, T^3}{\sqrt{\pi}} + O[T]^4\right)\right)\right)$$

$$\text{Abs}\left[(-1)^{\text{Floor}\left[\frac{1}{2}+\frac{\text{Arg}[T]}{\pi}\right]} e^{-\frac{i}{T^2}} \left((-1)^{\text{Floor}\left[\frac{2\,\text{Arg}[T]}{\pi}\right]} O[T]^4 + \left(-\frac{\left(\frac{1}{2}+\frac{i}{2}\right) a\, T}{\sqrt{\pi}} - \frac{\left(\frac{1}{16}-\frac{i}{16}\right)(8+15\,a)\, T^3}{\sqrt{\pi}} + O[T]^4\right) + e^{\frac{2\,i}{T^2}}\left(O[T]^4 + (-1)^{\text{Floor}\left[\frac{2\,\text{Arg}[T]}{\pi}\right]}\left(-\frac{\left(\frac{1}{2}-\frac{i}{2}\right) a\, T}{\sqrt{\pi}} - \frac{\left(\frac{1}{16}+\frac{i}{16}\right)(8+15\,a)\, T^3}{\sqrt{\pi}} + O[T]^4\right)\right)\right)\right]$$

$$e^{\text{Im}\left[\frac{1}{T^2}\right]-\pi\,\text{Im}\left[\text{Floor}\left[\frac{1}{2}+\frac{\text{Arg}[T]}{\pi}\right]\right]}\ \text{Abs}\left[(-1)^{\text{Floor}\left[\frac{2\,\text{Arg}[T]}{\pi}\right]} O[T]^4 + \left(-\frac{\left(\frac{1}{2}+\frac{i}{2}\right) a\, T}{\sqrt{\pi}} - \frac{\left(\frac{1}{16}-\frac{i}{16}\right)(8+15\,a)\, T^3}{\sqrt{\pi}} + O[T]^4\right) + e^{\frac{2\,i}{T^2}}\left(O[T]^4 + (-1)^{\text{Floor}\left[\frac{2\,\text{Arg}[T]}{\pi}\right]}\left(-\frac{\left(\frac{1}{2}-\frac{i}{2}\right) a\, T}{\sqrt{\pi}} - \frac{\left(\frac{1}{16}+\frac{i}{16}\right)(8+15\,a)\, T^3}{\sqrt{\pi}} + O[T]^4\right)\right)\right]$$

```
der2V[a_, T_] := D[(T^2) BesselJ[1, 1/(T^2)] + a BesselJ[2, 1/(T^2)], {T, 2}]
```

der2V[0, T]

der2V$\left[\frac{1}{2}, \text{T}\right]$

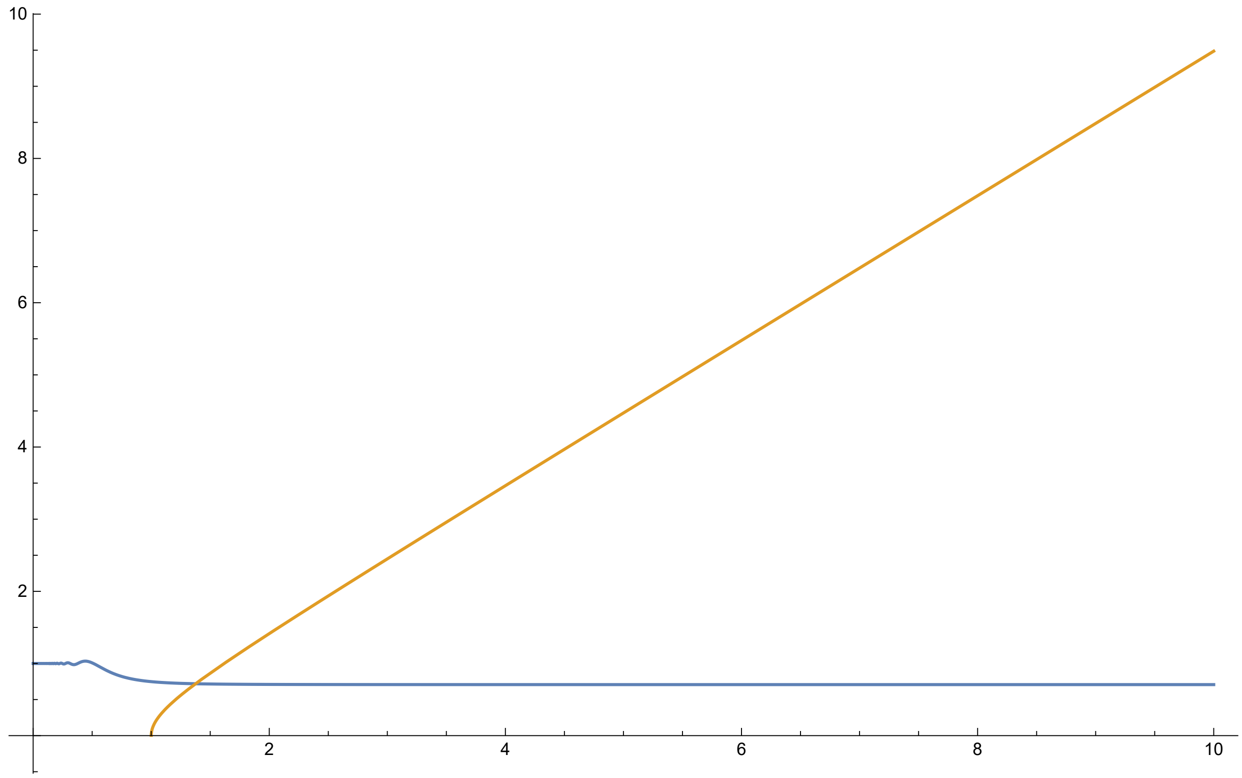
der2V[1, T]

$$2\,\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \frac{4\left(\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]\right)}{T^2} + T^2\left(\frac{3\left(\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]\right)}{T^4} - \frac{\frac{2\,\text{BesselJ}\left[1, \frac{1}{T^2}\right]}{T^3} + \frac{\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \text{BesselJ}\left[3, \frac{1}{T^2}\right]}{T^3}}{T^3}\right)$$

$$2\,\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \frac{4\left(\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]\right)}{T^2} + T^2\left(\frac{3\left(\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]\right)}{T^4} - \frac{\frac{2\,\text{BesselJ}\left[1, \frac{1}{T^2}\right]}{T^3} + \frac{\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \text{BesselJ}\left[3, \frac{1}{T^2}\right]}{T^3}}{T^3}\right) + \frac{1}{2}\left(\frac{3\left(\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \text{BesselJ}\left[3, \frac{1}{T^2}\right]\right)}{T^4} - \frac{-\frac{\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]}{T^3} + \frac{\text{BesselJ}\left[2, \frac{1}{T^2}\right] - \text{BesselJ}\left[4, \frac{1}{T^2}\right]}{T^3}}{T^3}\right)$$

$$2\,\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \frac{4\left(\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]\right)}{T^2} + T^2\left(\frac{3\left(\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]\right)}{T^4} - \frac{\frac{2\,\text{BesselJ}\left[1, \frac{1}{T^2}\right]}{T^3} + \frac{\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \text{BesselJ}\left[3, \frac{1}{T^2}\right]}{T^3}}{T^3}\right) + \frac{3\left(\text{BesselJ}\left[1, \frac{1}{T^2}\right] - \text{BesselJ}\left[3, \frac{1}{T^2}\right]\right)}{T^4} - \frac{-\frac{\text{BesselJ}\left[0, \frac{1}{T^2}\right] - \text{BesselJ}\left[2, \frac{1}{T^2}\right]}{T^3} + \frac{\text{BesselJ}\left[2, \frac{1}{T^2}\right] - \text{BesselJ}\left[4, \frac{1}{T^2}\right]}{T^3}}{T^3}$$

$$\text{Plot}\left[\left\{\sqrt{1-(\text{T}^\wedge 2)\ \text{BesselJ}\left[1,\ \frac{1}{\text{T}^\wedge 2}\right]},\ \text{T}\sqrt{1-\frac{1}{\text{T}}}\right\},\ \{\text{T},\ 0,\ 10\}\right]$$



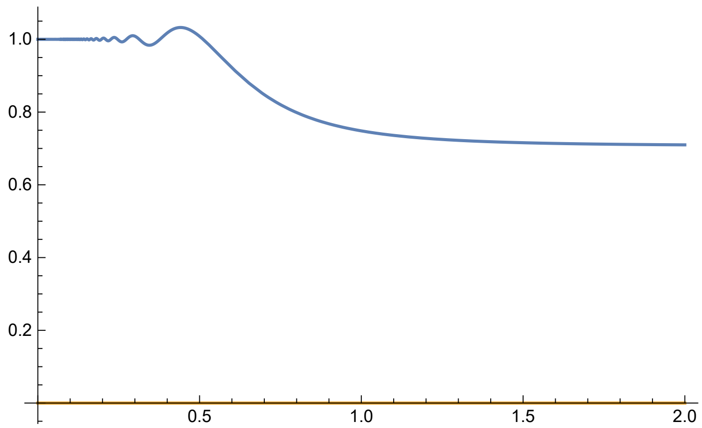
$$\text{M}\ (\text{T})\ =\ \text{M}\ (\text{T}=0)\ \sqrt{1-(\text{T}^\wedge 2)\ \text{BesselJ}\left[1,\ \frac{1}{\text{T}^\wedge 2}\right]}$$

$$\Rightarrow\quad \text{M}\ (\text{T})\ -\text{M}\ (\text{T}=0)\ =\ \text{M}\ (\text{T}=0)\ \sqrt{1-(\text{T}^\wedge 2)\ \text{BesselJ}\left[1,\ \frac{1}{\text{T}^\wedge 2}\right]}\ -\ \text{M}\ (\text{T}=0)$$

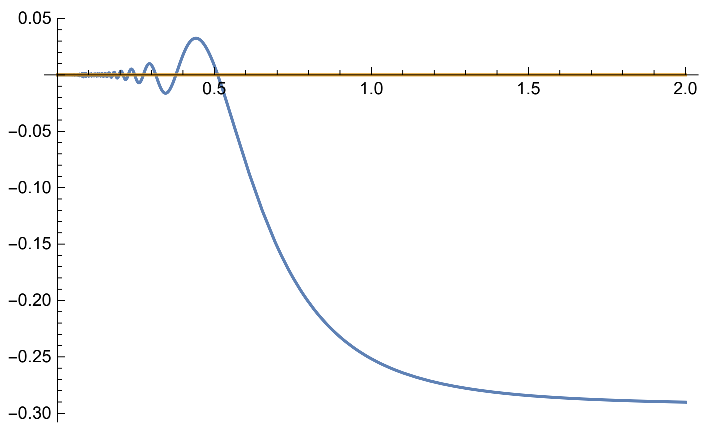
In units M (T = 0) :

$$\triangle\text{M}\ =\ \text{M}\ (\text{T})\ -1\ =\ \sqrt{1-(\text{T}^\wedge 2)\ \text{BesselJ}\left[1,\ \frac{1}{\text{T}^\wedge 2}\right]}\ -\ 1$$

$$\texttt{Plot}\left[\left\{\sqrt{1-(\texttt{T\^{}2})\ \texttt{BesselJ}\left[1,\ \frac{1}{\texttt{T\^{}2}}\right]},\ 0\right\},\ \{\texttt{T},\ 0,\ 2\}\right]$$



$$\texttt{Plot}\left[\left\{\sqrt{1-(\texttt{T\^{}2})\ \texttt{BesselJ}\left[1,\ \frac{1}{\texttt{T\^{}2}}\right]}-1,\ 0\right\},\ \{\texttt{T},\ 0,\ 2\}\right]$$



$$\sqrt{1-(\texttt{T\^{}2})\ \texttt{BesselJ}\left[1,\ \frac{1}{\texttt{T\^{}2}}\right]}\ \ /.\ \texttt{T} \to .5$$

1.00822

$$\texttt{D}\left[\sqrt{1-\left(\texttt{A}\ (\texttt{T\^{}2})\ \texttt{BesselJ}\left[1,\ \frac{1}{\texttt{T\^{}2}}\right]\right)},\ \{\texttt{T},\ 1\}\right]\ //\ \texttt{FullSimplify}$$

$$-\frac{\texttt{A BesselJ}\left[2,\ \frac{1}{\texttt{T}^2}\right]}{\texttt{T}\ \sqrt{1-\texttt{A}\ \texttt{T}^2\ \texttt{BesselJ}\left[1,\ \frac{1}{\texttt{T}^2}\right]}}$$

```
A = 1;
```

$$\text{Plot}\left[\left\{-\frac{\text{A BesselJ}\left[2, \frac{1}{T^2}\right]}{T\sqrt{1 - \text{A } T^2 \text{ BesselJ}\left[1, \frac{1}{T^2}\right]}}\right\}, \{T, 0, 2\}\right]$$