

```
> int( exp(-s*t)*sin(b*t), t=0..B);
```

$$-\frac{-b + b e^{(-s B)} \cos(b B) + s e^{(-s B)} \sin(b B)}{s^2 + b^2}$$

```
> limit( % , B=infinity );
```

$$\lim_{B \rightarrow \infty} -\frac{-b + b e^{(-s B)} \cos(b B) + s e^{(-s B)} \sin(b B)}{s^2 + b^2}$$

What the heck? Oh, I need to tell MAPLE that s is positive!

```
> assume( s>0 );
```

```
> int( exp(-s*t)*sin(b*t), t=0..B);
```

$$-\frac{-b + b e^{(-s B)} \cos(b B) + s e^{(-s B)} \sin(b B)}{s^2 + b^2}$$

```
> limit( % , B=infinity );
```

$$\frac{b}{s^2 + b^2}$$

I could have taken that first integral from 0 to infinity:

```
> int( exp(-s*t)*sin(b*t), t=0..infinity);
```

$$\frac{\sqrt{s^2 + b^2} b}{s \sqrt{1 + \frac{b^2}{s^2}} \left(\frac{s^2}{1 + \frac{b^2}{s^2}} + \frac{2 b^2}{1 + \frac{b^2}{s^2}} + \frac{b^4}{s^2 \left(1 + \frac{b^2}{s^2} \right)} \right)}$$

What the heck?

```
> simplify( % );
```

$$\frac{b}{s^2 + b^2}$$

Here are some linear algebra examples to keep in mind:

```
> with(linalg):
```

```
> A := matrix([ [ 1,2,3],[4,5,6],[7,8,9]]);
```

$$A := \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

```
> det(A);
```

$$0$$

```
> rref(A);
```

$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$$

```
> nullspace(A);
```

$$\{[1, -2, 1]\}$$

[> **eigenvalues(A);**

$$0, \frac{15}{2} + \frac{3\sqrt{33}}{2}, \frac{15}{2} - \frac{3\sqrt{33}}{2}$$

[> **eigenvectors(A);**

$$\left[\frac{15}{2} + \frac{3\sqrt{33}}{2}, 1, \left\{ \left[-\frac{1}{2} + \frac{3\sqrt{33}}{22}, \frac{1}{4} + \frac{3\sqrt{33}}{44}, 1 \right] \right\} \right],$$

$$\left[\frac{15}{2} - \frac{3\sqrt{33}}{2}, 1, \left\{ \left[-\frac{1}{2} - \frac{3\sqrt{33}}{22}, \frac{1}{4} - \frac{3\sqrt{33}}{44}, 1 \right] \right\} \right], [0, 1, \{[1, -2, 1]\}]$$

[And here is one last calculus command to keep in mind:

[> **diff(t^10*exp(2*t)*cos(5*t), t);**

$$10 t^9 e^{(2t)} \cos(5t) + 2 t^{10} e^{(2t)} \cos(5t) - 5 t^{10} e^{(2t)} \sin(5t)$$

[And if you want to differentiate it 10 times:

[> **diff(t^10*exp(2*t)*cos(5*t), t\$10);**

$$\begin{aligned} & -106343800 t^9 e^{(2t)} \cos(5t) - 2850871950 t^8 e^{(2t)} \cos(5t) - 5220460800 t^7 e^{(2t)} \cos(5t) \\ & + 16869837600 t^6 e^{(2t)} \cos(5t) + 32630895360 t^5 e^{(2t)} \cos(5t) + 1301832000 t^4 e^{(2t)} \cos(5t) \\ & - 10305792000 t^3 e^{(2t)} \cos(5t) - 1714608000 t^2 e^{(2t)} \cos(5t) + 72576000 t e^{(2t)} \cos(5t) \\ & - 10075536000 t^7 e^{(2t)} \sin(5t) + 16159899 t^{10} e^{(2t)} \cos(5t) + 365735500 t^9 e^{(2t)} \sin(5t) \\ & + 12631900 t^{10} e^{(2t)} \sin(5t) + 278964000 t^8 e^{(2t)} \sin(5t) - 19538064000 t^6 e^{(2t)} \sin(5t) \\ & + 11240208000 t^5 e^{(2t)} \sin(5t) + 26671680000 t^4 e^{(2t)} \sin(5t) + 4717440000 t^3 e^{(2t)} \sin(5t) \\ & - 1632960000 t^2 e^{(2t)} \sin(5t) + 3628800 e^{(2t)} \cos(5t) - 181440000 t e^{(2t)} \sin(5t) \end{aligned}$$

[Finally, if you want to stop assuming that s is positive, you need to type

[> **s := 's';**

$$s := s$$

[You might be surprised what you find out if you type:

[> **?laplace**