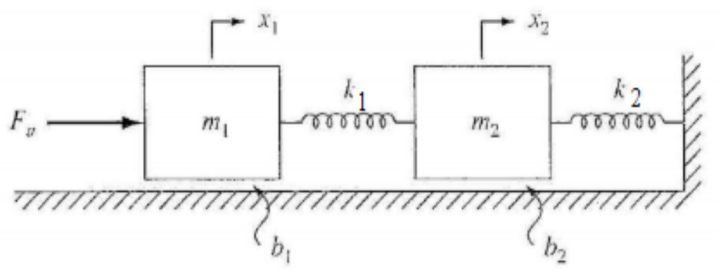
```
restart;
```

1

```
mass_spring_damper:=proc(n, M, K, B, F)
```

Example 1



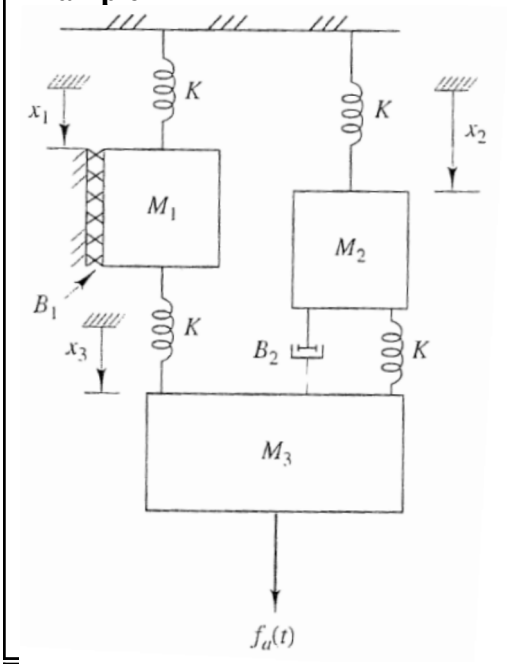

```
> #setup matrix K and B
  K:=<0,0;k__1,k__2>:
  B:=<b__1,0;0,b__2>:
  M=<m__1, m__2>:
  F:=<F__a,0>:

  #write down the equations
  eq:=mass_spring_damper(2, M, K, B, F)
```

$$M_1 \dot{x}_1(t) + b_1 \dot{x}_1(t) - k_1 \left(x_2(t) - x_1(t)\right) = F_a$$

$$M_2 \dot{x}_2(t) + b_2 \dot{x}_2(t) + k_1 \left(x_2(t) - x_1(t)\right) + k_2 x_2(t) = 0$$

$$eq := \{M_1 \dot{x}_1(t) + b_1 \dot{x}_1(t) - k_1 \left(x_2(t) - x_1(t)\right) = F_a, M_2 \dot{x}_2(t) + b_2 \dot{x}_2(t) + k_1 \left(x_2(t) - x_1(t)\right) + k_2 x_2(t) = 0\}$$

Example 2




```
> #clear used variables
  K:='K':
  M:='M':
```

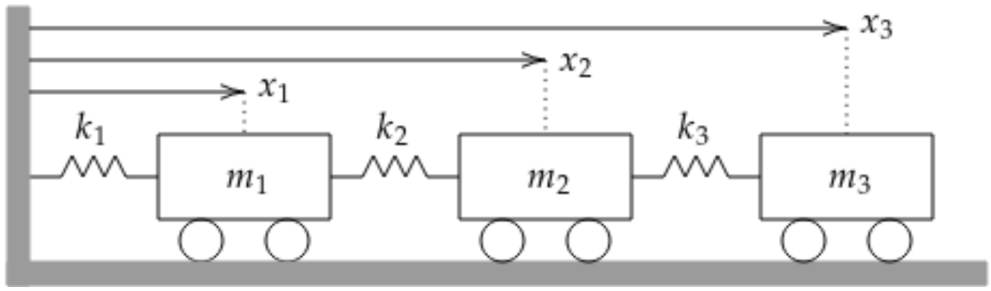
```
#setup matrix K and B
matK:=<K,0,0;0,K,0;K,K,0>:
matB:=<B__1,0,0;0,0,0;0,B__2,0>:
matM:=<M__1,M__2,M__3>:
matF:=<M__1*g(t),M__2*g(t),M__3*g(t)+f__a(t)>:

#write down the equations
eq:=mass_spring_damper(3, matM, matK, matB, matF):
```

$$M_1 \dot{x}_1(t) + B_1 \dot{x}_1(t) + K x_1(t) - K\left(x_3(t) - x_1(t)\right) = M_1 g(t)$$

$$M_2 \dot{x}_2(t) - B_2\left(\dot{x}_3(t) - \dot{x}_2(t)\right) + K x_2(t) - K\left(x_3(t) - x_2(t)\right) = M_2 g(t)$$

$$M_3 \dot{x}_3(t) + B_2\left(\dot{x}_3(t) - \dot{x}_2(t)\right) + K\left(x_3(t) - x_1(t)\right) + K\left(x_3(t) - x_2(t)\right) = M_3 g(t) + f_a(t)$$

Example 3




```
> #clear used variables
K:='K':
M:='M':

#setup matrix K and B
matK:=<k__1,0,0;k__2,0,0;0,k__3,0>:
matB:=<0,0,0;0,0,0;0,0,0>:
matM:=<m__1,m__2,m__3>:
matF:=<0,0,0>:

#write down the equations
eq:=mass_spring_damper(3, matM, matK, matB, matF):
```

$$m_1 \dot{x}_1(t) + k_1 x_1(t) - k_2\left(x_2(t) - x_1(t)\right) = 0$$

$$m_2 \dot{x}_2(t) + k_2\left(x_2(t) - x_1(t)\right) - k_3\left(x_3(t) - x_2(t)\right) = 0$$

$$m_3 \dot{x}_3(t) + k_3\left(x_3(t) - x_2(t)\right) = 0$$