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(* In Plane Motorcycle Dynamics *)
Rf = 2;      (*Ride Frequency*)
CofG = 0.55; (*CofG Forward Bias*)
Mass = 148.95;
Z = 0.35;    (*Zeta*)
p = 1.315; b = p * CofG;
Ip = 38;
USMf = 20.95; USMr = 19.65; US = {USMf, USMr};
Mf = CofG * Mass - USMf;

Mr = Mass - Mf - USMr - USMf;
Mf + Mr + USMf + USMr;
M = {Mf, Mr};
k = M * (2 * Pi * Rf) ^ 2;
Cc = 2 * Sqrt[k * M]
c = Z * Cc;

{1532.41, 1190.73}

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ktf = 159 000;
ktr = 159 000;
kt = {ktf, ktr};
K = (k * kt) / (k + kt);
Kf = 11480;
Kr = 6500;
Cf = 600;
Cr = 600;
Ctf = 100;
Ctr = 1000;

```

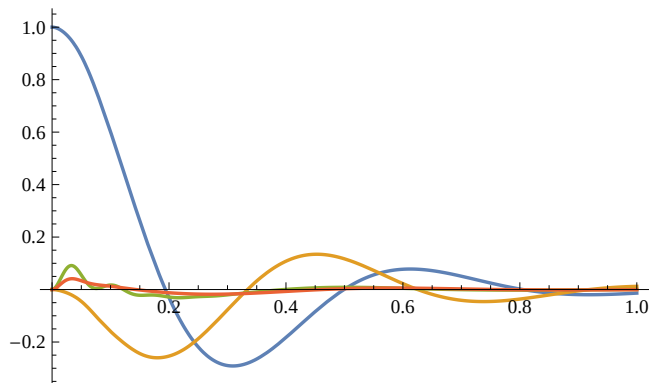
$$\text{Response} = \begin{pmatrix} \text{Mass} & 0 & 0 & 0 \\ 0 & \text{Ip} & 0 & 0 \\ 0 & 0 & \text{USMf} & 0 \\ 0 & 0 & 0 & \text{USMr} \end{pmatrix} \cdot \begin{pmatrix} x''[t] \\ \text{Phi}''[t] \\ x f''[t] \\ x r''[t] \end{pmatrix} + \\
\begin{pmatrix} C f + C r & C f (p - b) - C r * b & -C f & -C r \\ C f (p - b) - C r * b & C f (p - b)^2 + C r * b^2 & -(p - b) C r & b * C r \\ -C f & -(p - b) C f & C f + C t f & 0 \\ -C r & b * C r & 0 & C r + C t r \end{pmatrix} \cdot \begin{pmatrix} x'[t] \\ \text{Phi}'[t] \\ x f'[t] \\ x r'[t] \end{pmatrix} + \\
\begin{pmatrix} K f + K r & K f (p - b) - K r * b & -K f & -K r \\ K f (p - b) - K r * b & K f (p - b)^2 + K r * b^2 & -(p - b) K r & b * K r \\ -K f & -(p - b) K f & K f + k t f & 0 \\ -K r & b * K r & 0 & K r + k t r \end{pmatrix} \cdot \begin{pmatrix} x[t] \\ \text{Phi}[t] \\ x f[t] \\ x r[t] \end{pmatrix};$$

```

Dyn = NDSolve[{Response[[1]] == 0, Response[[2]] == 0, Response[[3]] == 0,
Response[[4]] == 0, x[0] == 1, x'[0] == 0, Phi[0] == 0, Phi'[0] == 0,
xf[0] == 0, xf'[0] == 0, xr[0] == 0, xr'[0] == 0}, {x, Phi, xf, xr}, {t, 0, 1}];

```

```
Plot[Evaluate[{x[t], Phi[t], xf[t], xr[t]} /. Dyn], {t, 0, 1}, PlotRange -> All]
```



```
P1 = Plot[Evaluate[{x[t]} /. Dyn], {t, 0, 1}, PlotRange -> All];  

(*P2=Plot[Evaluate[{Phi[t]} /. Dyn], {t, 0, 1}, PlotRange->All];  

P3=Plot[Evaluate[{xf[t]} /. Dyn], {t, 0, 1}, PlotRange->All];  

P4=Plot[Evaluate[{xr[t]} /. Dyn], {t, 0, 1}, PlotRange->All];*)
```

```
pts1 = Cases[P1, {_?NumericQ, _?NumericQ}, {6}];  

Export["Excel.XLS", {pts1}, "XLS"];
```